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PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1874.

PHILADELPHIA:
ACADEMY OF NATURAL SCIENCES,
Corner Broad and Sansom Streets.
1874.

HALL OF THE ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA, February 4, 1875.

I hereby certify that printed copies of the Proceedings for 1874 have been presented at the meetings of the Academy, as follows:—

Pages	9 to 24	. . . .	April 28, 1874.
"	25 to 72	. . . .	May 19, 1874.
"	73 to 104	. . . .	August 18, 1874.
"	105 to 136	. . . .	September 29, 1874.
"	137 to 152	. . . .	October 20, 1874.
"	153 to 200	. . . .	December 15, 1874.

SAMUEL B. HOWELL, M.D.,
Recording Secretary.

Pages	201 to 216	. . . .	January 5, 1875.
"	217 to 232	. . . .	February 2, 1875.

EDWARD J. NOLAN, M.D.,
Recording Secretary.

PHILADELPHIA:
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LIST OF CONTRIBUTORS,

With reference to the several articles contributed by each.

For Verbal Communications see General Index.

PROCEEDINGS

OF THE

ACADEMY OF NATURAL SCIENCES

OF

PHILADELPHIA.

1874.

JANUARY 6, 1874.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-two members present.

Dr. J. G. HUNT remarked that the structure of the *Schizæa pusilla* differed widely from that of our other indigenous schizaceous ferns, viz., *Lygodium palmatum*, and its morphological elements are unlike those of our ferns in general. The barren frond of *Schizæa pusilla* is marked on its epidermal surface with a *double line* of stomata, and these organs extend the entire length of the frond. The cells which make up the interior of this delicate fern are cylindrical and vary in size, but their distinctive characters lie in minute projections or outgrowths from all sides of the cells, and these projections meet and are articulated with corresponding outgrowth from adjoining cells, so that the cells of *Schizæa* have penetrating between them in every direction intercellular spaces and channels of *remarkable regularity* and beauty, and so characteristic is this plan of cell-union that the botanist need find no difficulty in identifying the smallest fragment of the plant. This morphological peculiarity has not been noticed before.

Dimorphous Flowers in Passiflora.—Mr. THOMAS MEEHAN exhibited some flowers of *Passiflora quadrangularis*, in which some of them had the pistils almost wanting, while the flowers were

perfect in all other particulars. A large plant running along a rafter in his greenhouse, and producing hundreds of flowers, bore these dimorphous ones in about equal proportions. He said it was well known that in cultivation this plant never produced fruit unless by artificial cross-impregnation, but he thought the tendency to abort in the female flowers, and thus approach the classes which were in structure as well as practically uni-sexual, had not been noticed before. There was a species in New Zealand, however, known to be monœcious, and it might be just possible that the *Passifloraceæ*, with mostly hermaphrodite flowers, were following in the wake of the allied *Cucurbitaceæ*, in which a complete separation of the sexes was the rule.

JANUARY 13.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

Remarks on Hydra.—Prof. LEIDY remarked that two species of *Hydra* were common in the neighborhood of Philadelphia. One is of a light brownish hue and is found on the under side of stones and on aquatic plants in the Delaware and Schuylkill rivers, and in ditches communicating with the same. Preserved in an aquarium, after some days the animals will often elongate the tentacula for several inches in length. The green *Hydra* is found in ponds and springs attached to aquatic plants. It has from six to eight tentacles, which never elongate to the extent they do in the brown *Hydra*. In winter the animal is frequently observed with the male organs developed just below the head as a mamma-like process on each side of the body. He had not been able to satisfy himself that these *Hydræ* were different from *H. fusca* and *H. viridis* of Europe. Prof. Agassiz had indicated similar colored forms in Massachusetts and Connecticut, under the names of *H. carnea* and *H. gracilis*. Of the former he remarks that it has very short tentacles, and if this is correct under all circumstances, it must be different from our brown *Hydra*, which can elongate its arms for three inches or more.

JANUARY 20.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

Prof. E. D. COPE described some species of extinct tortoises from certain formations of Northeastern Colorado, which had been previously found in the Fort Union or lignite beds of the Missouri river region by Dr. Hayden. He had in 1868 recognized

the age of the latter as cretaceous, contrary to the opinion expressed by some geologists, that the formation both in Dakota and Colorado is tertiary.

Mr. COPE incidentally mentioned the recent discovery of remains of *Dinosaurs* in the lignite beds of Colorado, which were thus proved to belong to the cretaceous period, and not tertiary, as the evidence of the fossil plants had been interpreted by Mr. Lesquereux and others.

Dr. LECONTE expressed his great satisfaction at the complete confirmation, by his friend Mr. Cope, of the statements he made several years ago,[1] concerning the cretaceous age of the lignites at the eastern base of the Rocky Mountains, from near Denver southwards into New Mexico. Dr. LeConte had discussed the subject on page 19, and more fully on 65 and 66 of his report. He had, it is true, expressed on page 65 a suspicion that the lignites of the Missouri basin might be of miocene age, but it would be seen by the narrative part of the report that Dr. LeConte had not examined these beds personally, and their tertiary age was assumed only in deference to the very strongly expressed opinion of Dr. Hayden, "the pioneer and most successful explorer of the Missouri basin" (Report, page 53), who was the first, as he has been the most persistent advocate of this view. While admitting the similarity of the flora of these lignites to those of known tertiary localities, he had insisted on the greater value of the stratigraphical and zoological evidence by which they were shown to be cretaceous. He referred Mr. Cope to this report, that he might see how perfectly these recent discoveries accorded with the previously expressed views, which Mr. Cope had, perhaps inadvertently, omitted to mention.

Mr. COPE replied that he was quite familiar with the report of Dr. LeConte, but did not consider stratigraphical evidence of value as compared with palæontological in this instance, because the beds display continuity of deposit from cretaceous to tertiary (Hayden), while the fauna and flora exhibit an interruption.

Prof. FRAZER remarked that in this opinion Mr. Cope differed from geologists generally, who regarded the weight of palæontological evidence as based entirely on our previous knowledge of stratigraphical relations, and where the field was so new as our Western territories, the evidences of palæontology as establishing synchronism with the geological ages of Europe must be received with great caution.

[1] Notes on the Geology of the Survey for the Extension of the Union Pacific Railway, Eastern Division. Philadelphia, Feb. 1867.

JANUARY 27.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

Henry A. Muhlenberg, of Reading, Pa., George De B. Keim, Henry Tagg, Chas. S. Whelen, and Charles W. Macfarlane, were elected members.

Jas. Stevenson, U. S. Geol. Surv., was elected a Correspondent.

Prof. COPE made some observations on the age of the lignite and other corresponding formations of the West, and especially its supposed equivalent in Northern Colorado. He referred to his determination of the Upper Missouri formation as cretaceous in 1868; of the Wyoming Bitter Creek series as of the same age in 1872. He now added the Colorado strata to the same, on the evidence of vertebrate remains procured by himself during the past season, in connection with the United States Geological Survey under Dr. F. V. Hayden. These remains consisted of *Dinosauria* of three species, tortoises of five, and a single species of crocodile. Five of the genera were diagnostic. The *Dinosauria* were referred to the old genus *Hadrosaurus* and the new genera *Polyonax* and *Cionodon*. The *Cionodon arctatus* was a large herbivorous saurian, allied to *Hadrosaurus*, but with a most complex and singular type of dentition; the size that of a horse. The other two species are much larger.

He also pointed out that the tortoises are identical with species discovered by Dr. Hayden in the Fort Union formation of Dakota. He identified the Colorado beds with this group, and believed that they are therefore of cretaceous age, stating that it was the first time such identification had been made.

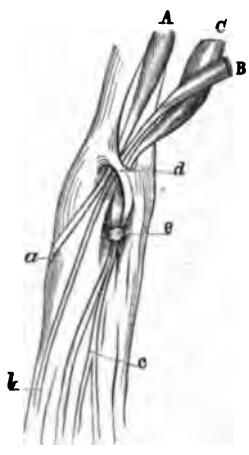
Prof. Cope then discussed the age of the coal and lignite formations west of the Missouri River, and stated that Dr. Hayden had divided them into several epochs, viz., the Placer Mountain (New Mexico); Cañon City (Colorado); Fort Union (Dakota); and Bear River (Wyoming); and that Mr. Meek and himself had regarded the Bitter Creek series as distinct from the others. He stated that the stratigraphers and vegetable palæontologists had regarded all these beds as tertiary, but he believed that the animal and especially the vertebrate palæontology required their reference to the cretaceous period. He observed that Mr. Meek had pointed out the cretaceous age of the Bear River beds. LeConte had insisted on the same reference for the Cañon City basin. Mr. King and himself had determined that the Bitter Creek coal was cretaceous, and he had asserted that the Fort Union epoch belonged to the same division of geologic time, in Dakota in 1869, and for

Colorado at the last meeting of the Academy, although LeConte and others had regarded them as probably miocene.[1] He stated, moreover, that the evidence from palæontology was discrepant, and that it must be conceded that a tertiary flora was contemporary with a cretaceous fauna. He quoted Dr. Hayden as having shown that there was no physical interruption in the series of deposits above enumerated, and that the incongruity in the palæontology is to be regarded as evidence that no extinction or recreation of a general character had taken place during this time; that the apparent interruption in the vertebrate life in the disappearance of large land saurians and appearance of land mammalia is due to the irruption of the latter by migration probably from the south.

FEBRUARY 3.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.



Dr. CHAPMAN exhibited a dissection of one of the hind legs of a muskrat, *Fiber zibethicus*. The tendons of the tibialis anticus (*a*), extensor proprius hallucis (*b*), and extensor longus digitorum (*c*), pass down a groove in the tibia and under a little process of bone (*d*). The extensor longus digitorum is held down by an additional process (*e*). This arrangement seems to quicken the extension of the foot, and is of use apparently to the animal in swimming.

Remarks on Protozoa.—Prof. LEIDY remarked that while it was exceptional to find the same species of the higher subkingdoms in the different parts of the world, it appeared to be the rule that most species of *Protozoa* were found everywhere under the same conditions. A large number of our fresh-water forms he had recognized as the same as those described by European authors. A less number of species are probably peculiar to every region. Among our fresh-water *Rhizopods* he had observed not only the genera *Amœba*, *Arcella*, *Difflugia*, *Euglypha*, *Trinema*, *Lagynis*, *Actinophrys*, etc., but also most of the species of these as indicated by European naturalists.

[1] LeConte, Notes on Geol. Pacific R. R. Co., 1868, p. 65.

Of the genus *Arcella*, *A. vulgaris* and *A. dentata*, with their varieties, are common with us. In the genus *Difflugia* the likeness of our species to those of Europe is striking. Besides *D. proteiformis*, *D. acuminata*, *D. compressa*, *D. pyriformis*, *D. aculeata*, etc., he had observed the beautiful form described by the English naturalist, Dr. Wallich, under the name of *D. corona*. The shell of this species resembles a Roman helmet, with from five to seven spines, and it has the mouth notched with twelve serrations. A comparatively large species observed may be peculiar, though future investigation may prove it to be only a variety of *D. lageniformis*. The shell has the form of an ancient amphora, without the handles, and it measures the fourth of a line in length. With its delicate pseudopods of varied form, and sometimes extending far beyond the length of the shell, it appears as a microscopic vase of phantom plants.

Among *Amœba* he had observed one which he suspected to be the same as *A. princeps* of Ehrenberg, but it was twice the size given by this author. It was remarkable for its activity and wonderful changes of form. At first globular, the next moment pseudopods appear like a multitude of dewdrops all over the surface. A few of these stream forth and widen in their course, while others disappear. The animal will then extend itself and appear like a branching coral. At one moment it will enter and traverse the interstices of a mass of mud and sand, and then emerge without an adherent particle. Detached and floating it will appear like a long-rayed star. At times it assumes the most grotesque forms—that of a human head with a rapidly growing nose; the outline of an elk with the antlers extending, or a leg elongating at the expense of the body. The species is common in the vicinity of Philadelphia. First observed in the neighborhood of Swarthmore College, it was also found in the ditches of the Neck below the city. The animal contained a multitude of minute particles of ellipsoidal form which reminded him of the discoliths of the *Bathybius* of Prof. Huxley.

It is an interesting question whether our fresh-water protozoa have reached us from the same sources as those of Europe and other remote countries. If derived from the same sources they were probably infused in the waters of the different continents at an early age when the latter were not separated by ocean barriers. If thus early infused we have a remarkable instance of a multitude of specific forms retaining their identity through a long period of time. Such a view might appear to oppose the doctrine of evolution, but not justly so, for the simplest forms would be the slowest or least likely to vary, while the most com-

x, from their extended relationships, would be most liable to

ation. Perhaps, however, the simplest forms of life, of the

e species, may have originated independently of one another,

only in different places, but also at different times, and may

yet continue to do so. While the highest forms of life may have been slowly evolved from the simplest forms of the remotest age, equally simple forms may have started into existence at all times down to the present period. From the later original forms new ones may have been evolved to speed towards the same goal as those which preceded them.

FEBRUARY 10.

The President, Dr. RUSCHENBURGER, in the chair.

Twenty-four members present.

The death of Prof. William Procter was announced.

FEBRUARY 17.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

On the Mode of Growth of Desmids.—Prof. LEIDY made some remarks on the mode of reproduction and growth of the *Desmids*. In illustration he described a common species of *Docidium* or *Pleurotænium*. This consists of a long cylindroid cell constricted at the middle and slightly expanded each side of the constriction. When the plant is about to duplicate itself, the cell-wall divides transversely at the constriction. From the open end of each half cell there protrudes a colorless mass of protoplasm defined by the primordial utricle. The protrusions of the half-cells adhere together and continue to grow. The bands of endochrome now extend into the protrusions and subsequently keep pace with their growth. The protrusions continue to grow until they acquire the length and form of the half-cells from which they started. The exterior of the new half-cells thus produced hardens or becomes a cell-wall like that of the parent half-cells. In this condition two individuals of *Docidium* are frequently observed before separation. During the growth of the new half-cells the circulation of granules in the colorless protoplasm is quite active. In a species of *Docidium* $1\frac{1}{2}$ mm. long by $\frac{1}{10}$ mm. broad, the growth of the new half-cells was observed to be at the rate of about $\frac{1}{3}$ mm. in an hour.

FEBRUARY 24.

The President, Dr. RUSCHENBERGER, in the chair.

Seventeen members present.

The death of Col. Jas. Greer was announced.

There not being a sufficient number of members present for an election, the meeting adjourned until March 3d, when the following were elected members: John B. Pease, Gen. Isaac J. Wistar, Gen. Wm. Tilley, Wm. M. Bowron, John T. Sharpless, M.D., Samuel J. Reeve, and John F. Weightman, M.D.

The following standing committees were elected for 1874:—

ANTHROPOLOGY.
J. Aitken Meigs,
Henry S. Schell,
J. F. Richardson,
E. Goldsmith.

COMPARATIVE ANATOMY.
Harrison Allen,
J. McQuillan,
Jos. Leidy,
Henry C. Chapman.

ORNITHOLOGY.
Bernard A. Hoopes,
Edwin Sheppard,
Theo. L. Harrison,
Jas. A. Ogden,
John Krider.

ARTICULATA.
Geo. H. Horn,
R. S. Kenderdine,
T. Hale Streets,
John L. LeConte.

RADIATA.
Geo. H. Horn,
J. G. Hunt,
R. S. Kenderdine,
Samuel B. Howell.

STRATIGRAPHIC GEOLOGY.
Jos. P. Lesley,
F. V. Hayden,
Franklin Platt.

VERTEBRATE PALÆONTOLOGY.
Jos. Leidy,
Edw. D. Cope,
Harrison Allen.

MINERALOGY.
Wm. S. Vaux,
E. Goldsmith,
Jos. Wilcox,
C. S. Bement,
Persifor Frazer, Jr.

BOTANY.
Thos. Meehan,
Rachel Bodley,
Isaac Burk,
John H. Redfield.

MAMMALOGY.
Harrison Allen,
Edw. D. Cope,
Henry C. Chapman,
U. Smith.

ICHTHYOLOGY.
Edw. D. Cope,
Thaddeus Norris,
J. H. Redfield,
Chas. F. Parker.

HERPETOLOGY.
Edw. D. Cope,
Harrison Allen,
Samuel B. Howell,
Chas. F. Parker.

PHYSICS.
Robert E. Rogers,
J. G. Hunt,
Robert Bridges,
J. H. McQuillan,
Alex. Wilcox.

INVERTEBRATE PALÆONTOLOGY.
T. A. Conrad,
H. C. Wood, Jr.,
Persifor Frazer, Jr.,
Geo. A. Köenig.

CHEMISTRY.
F. A. Genth,
Robert Bridges,
E. Goldsmith,
Samuel B. Howell.

INSTRUCTION AND LECTURES.
Hector Tyndale,
Robert S. Kenderdine,
Wm. S. Halsey,
J. Aitken Meigs,
W. S. W. Ruschenberger.

LIBRARY.
Jos. Leidy,
Chas. F. Parker,
Geo. W. Tryon, Jr.,
W. S. W. Ruschenberger,
J. G. Richardson.

MARCH 3.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

The following paper was presented for publication:—

"Remarks on the Tertiary Clay of the Upper Amazon, with descriptions of new shells." By T. A. Conrad.

Extract of a Letter relating to Mammalian Fossils in California.—Prof. LEIDY read an extract from a letter recently received from Dr. Lorenzo G. Yates, of Centreville, Alameda County, California, as follows:—

Yours of the 29th came to hand, and also a copy of your work, "Contributions to the Extinct Vertebrate Fauna of the Western Territories," for which accept my thanks. Prof. E. O. Hovey's statement in relation to the localities of some of the fossils, page 229, of the "Contributions," is incorrect. I discovered all the fossils in a gravel deposit, which was evidently an old river channel, in Livermore Valley, not from a "wash in the side of a hill."

The Bos latifrons, figs. 6, 7, plate xxviii.; the Canis indianensis, fig. 2, pl. xxxi.; the Felis imperialis, fig. 3, pl. xxxi.; and the Auchenia hesterna, figs. 1–3, pl. xxxvii., together with the teeth and bones of Elephas americanus, Equus, and the other bones which I could not identify, were all discovered by me in that locality.

Accompanying the letter was a newspaper slip of the discovery of remains of Elephant and Mastodon in various localities, which is here inserted.

At a meeting of the Agassiz Institute at Sacramento, on the 17th of June, the following paper by Dr. L. G. Yates, of Centreville, Alameda County, was read:—

The interest taken within the last few years in the "antiquity of man" has invested the finding of the remains of the extnct mammalia with a greater degree of interest than they would otherwise receive, and the question is one which has by common consent been admitted to be one of the most important which has been raised of late years, consequently the discovery of the bones and teeth of any of the larger animals, their geological location and surroundings, is matter of interest to men of science and the majority of educated minds of all classes.

Less than fifty years ago the discovery of the bones of a fossil elephant, or other large animal, would have been looked upon as evidence supporting some popular superstition in relation to giants or tritons, and by some, less sceptical than the majority, they would have been called a lusus naturæ, or, as the writer has heard them pronounced within the last three or four years, "peculiarly formed rock," or "the bones of some common animal which has grown in size since the animal died." But the majority of the people of California at the present day are better informed on the subject, and admit the finding of remains of extinct animals of size and form different from those now existing in temperate regions; yet, within the last two or three years, the writer remembers having seen an item in one of our interior papers, giving an account of the finding of a "huge tibia," and giving it (on the authority of some "Doctor") as the bone of a "human" or of some other "upright walking animal."

But the principal object of the writer of this article, is to furnish a list of localities of remains of fossil elephants and mastodons, to which additions may be made from time to time.

The writer, during a residence of eight years in California, has spent considerable time in visiting locations where the fossils have been discovered by others, and has succeeded in discovering a number of localities not before known, where fragments of bones and teeth, portions of skeletons, and, in some instances, whole skeletons of the large pachyderms have been found, and has been so fortunate as to discover the only new species, and, at the same time, probably the oldest mastodon found on the Pacific Coast.

List of Localities—Fossil Elephas.

Alameda County.—No. 1. Near Mission San Jose, Elephas Americanus and E. ——? Discovered by the writer in post pliocene detritus with Mastodon, Lama, Equus, Bos, and a large carnivore; upper molar deposited in Amherst College; portion of lower jaw with molar in Yale College, and portion of tusk in Wabash College.

No. 2. In Livermore Valley, two large molars of Elephas Americanus, discovered by the writer in post pliocene with Lama California? Bos, Equus, Cervus, etc.; one molar in Wabash College, the other in writer's collection.

No. 3. Portion of tusk, from bed of a creek between Haywood and Dublin, formerly in writer's cabinet, deposited in Wabash College.

Calaveras County.—No. 1. Near Murphy's, in auriferous gravel, fragment of molar of Elephas Americanus, discovered by the writer; deposited in Yale College.

Los Angelos County.—At San Pedro.

Placer County.—No. 1. Near Forest Hill.

No. 2. Near Michigan Bluff, in auriferous gravel.

Solano County.—No. 1. At Mare Island, molar. (W. P. Blake, Proc. Cal. Acad. Nat. Science.)

No. 2. Near Rio Vista, entire skeleton of Elephas Americanus, about seven feet below the surface in clay. The party who discovered it "went for it" with a pick, and with the assistance of his neighbors, and by dint of perseverance and hard labor, they succeeded in entirely destroying the bones, so that when the writer visited the locality he found a large pile of small fragments, and succeeded in obtaining casts of portion of the right side of lower jaw with molar, and a portion of upper molar; which, with three or four vertebræ, comprised all that was taken, and they were so broken that they had to be built up and partially restored in order to get the casts.

Fossil Mastodon.

Alameda County.—No. 1. Near Mission San Jose, in post pliocene gravel, the writer discovered an almost entire lower jaw,

containing five molars, and showing in a remarkable degree the method of growth and replacement of the teeth; deposited in Yale College.

No. 2. Molar in bowlder of conglomerate, found in Alameda Creek, and presented to writer; deposited in Yale College.

Amador County.—Near Volcano, in auriferous gravel. Locality visited.

Calaveras County.—At Douglas Flat, near Murphy's. Locality visited.

Contra Costa County.—No. 1. At Oak Springs, lower jaw entire and upper molars of Mastodon obscurus, taken out of the base of a pliocene hill by the writer; entire skeleton in the rock, but impossible to take it out; lower jaw and upper molar in Amherst College; upper molar and fragment of tusk in Yale College.

No. 2. Molar taken out of tunnel on the railroad between Somersville and Pittsburg Landing. Locality visited.

El Dorado County.—No. 1. At Grey's Flat, molars in recent gravel deposit. Locality visited.

No. 2. El Dorado Ranch, several molars and fragment. Locality visited. The "Doctor" who had them pronounced them "Saurian teeth." The teeth had been broken up, and he called each fragment (consisting of a cusp) an entire tooth, but on seeing the pieces put together, and forming a large molar, he thought "perhaps it might be so," but seemed loth to believe it, and refused to part with even a fragment.

No. 3. At Gold Hill, near Placerville.

Mendocino County.—Locality unknown.

Placer County.—On North Fork of American River, above Rattlesnake, in gravel. Locality visited.

Santa Barbara County.—At Gaviota Pass. (Prof. J. D. Whitney.)

Stanislaus County.—On Dry Creek, Mastodon Shepardi; new species discovered by the writer in pliocene sandstone, at the base of a high perpendicular bluff; fragments of tusks in Amherst and Yale Colleges.

Solano County.—Near Benicia. Locality visited.

Sonoma County.—Near Petaluma. Bones in recent deposit near creek. Locality visited.

Tuolumne County.—No. 1. At Texas Flat, in auriferous gravel. Locality visited.

No. 2. At Shaw's Flat, in auriferous gravel. Locality visited.

No. 3. At Gold Springs, in auriferous gravel. Locality visited.

No. 4. Under Table Mountain? (Dr. Snell) in old river bed. Locality visited.

It will be seen that the majority of the localities given have been visited by the writer. Particular attention has been given to the formations and accompanying fossils, and search made for evidences of the handiwork of man, but up to this time the writer has failed to discover anything which would show conclusively

that man and either the mastodon or the fossil elephant were contemporaneous in this State.

The stories of the finding of bones and teeth of fossil vertebrates, by miners and persons not practical geologists, nor accustomed to study the geological whys and wherefores, and who do not realize the necessity of close observation and discrimation of the circumstances and surroundings of the relics, are not, in the writer's opinion, entitled to much weight, and are very liable to give false impressions; for example, in a ravine in Alameda County, the writer found a human skull in the bank, some thirty feet below the surface, and apparently in the same formation where he had previously discovered bones and teeth of Elephas, and afterward found a lower jaw of Mastodon and molar of Elephas, but upon climbing to the top of the bank, the remaining portions of the human skeleton were found some eighteen inches below the surface in an old Indian burial ground or rancheria. It would have been an easy matter to have labelled that skull as "found with bones of Elephant and Mastodon," and passed it off as another link in the chain of evidence of the contemporaneousness of man and the extinct animals; or the creek in the ravine might have changed its bed and the human skull been covered up by detritus in close proximity with the mastodon jaw, and after many years discovered by some future fossil hunter, and the remains of the two animals assigned, without question, to the same age.

One more example. Some four years since, a friend brought me a remarkably well-preserved molar of a mastodon, imbedded in a bowlder of conglomerate, which he had found in Alameda creek. Now, suppose that tooth, instead of being placed in the writer's cabinet, had been carried by a freshet on to some gravel bed along the creek, and the skull of some aborigine washed out of the bank above (as they often do), or some of the stone implements sometimes found there had been deposited in the same place. Perhaps in a few hundred years or less, some antiquarian or ethnologist finding these relics in the same gravel bed might at once decide that they were of the same age, when in fact the mastodon tooth washed out of a pliocene gravel bed, miles from where it was found, and it may have been (and probably was) separated from the other parts of the skeleton, and carried by the action of water perhaps hundreds of miles before it was deposited in the pliocene conglomerate; or, to carry the probabilities still further, the mastodon might have lived in the miocene period, and the tooth washed out of a miocene rock by a pliocene river, to where it was again deposited, and afterward formed a part of the conglomerate bowlder in which it was found.

The death of Dr. John Bachman, a Correspondent of the Academy, was announced.

MARCH 10.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

The following papers were presented for publication:—

"On the Anatomy of Ariolimax and other Pulmonata." By W. G. Binney.

"Descriptions of some new species of Reptiles." By Edward D. Cope.

Elevation of the Trunks of Trees.—Mr. THOMAS MEEHAN referred to remarks made on a former occasion—not communicating anything new to science—but in regard to matter introduced into a lawsuit, as to whether the trunks of trees would elongate after once formed. He suggested that trees growing on a rock, by the natural thickening of the roots beneath, would lift the tree four inches in forty years, which covered the matter in dispute.

Since that time, however, Dr. Lapham, the Botanist, and State Geologist of Wisconsin, had called his attention to a force at work in elevating the trees of that region, which he believes had not before been recognized, and which he thought of interest sufficient to merit a notice in the Academy's Proceedings. This was that frost gradually lifted trees so that the trunk would sometimes appear in time to have elongated a foot or more.

Since Dr. Lapham had made the suggestions, he had examined trees in the vicinity of Philadelphia and found unmistakable evidence that large numbers of trees had been raised in the manner stated. As was well known, most trees standing by themselves had the collar of the tree of much greater diameter than the trunk above; and the upper portions of the roots, springing from about the collar, were considerably above the surface of the ground. He had supposed, and he thought this was the impression of most observers, that this arose merely from the annual deposition of wood—the thickening upwards of the roots—but, on examination, it could be seen in many cases that the axis, or original centre of the root, once of course below the soil, was now above the surface.

That this was caused by the action of frost was probable from what we know of its action on vegetation by what is known as "drawing out." When the land freezes, expansion ensues, drawing the clover root up with it, leaving, of course, a cavity from whence the root was drawn. When the first thaw came, the liquid, carrying earthy matter, entered the cavity; and thus the clover root was prevented from descending to its original position.

It was as true of trees as of the clover plant. Roots elevated found the cavities below partially filled, and could not thus permit of the tree being quite as low as before. Dr. Lapham thought that in the West large old trees blew over much more readily than younger ones, though the comparative weight of head and roots were proportionally the same, chiefly because the older trees had been drawn nearer the surface.

Mr. M. also remarked that the belief was very prevalent among woodmen, that the numerous large roots which marked the surface of an old piece of woodland "like railroads on a modern map" were not originally near the top, but had grown to the surface. He had always supposed these also to result from thickening, but he now had seen some cases in which this would not account for it, and only the frost-lifting power would. So, also, in many swampy pieces of land, much of the vegetation had the appearance of tussocks, and the land as if it had been washed away from around the roots. It was not probably from annual growths, but from gradual liftings of the plants from year to year and the filling in of the spaces beneath by the soft mud.

It was likely that one of the chief offices of the tap roots was to guard the tree from this frost lifting as much as possible. His impression was that the trees of tropical climates had not near the development of tap roots which are found in the more northern ones, but this was a matter for further investigation.

MARCH 17.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty members present.

The death of Dr. Wm. S. Halsey was announced.

MARCH 24.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-seven members present.

On Actinophrys sol.—Prof. LEIDY, after describing the structure and habits of this curious rhizopod, said that he had recently observed it in a condition which he had not seen described. He had accidentally found two individuals including between them a finely granular rayless sphere nearly as large as the animals themselves. These measured, independently of the rays, 0.064 mm. in diameter; the included sphere 0.06 mm. He supposed that he had been so fortunate as to find two individuals of Actinophrys in conjunction with the production of an ovum.

Preserving the animals for observation, on returning after an absence of three hours, the animals were observed connected by a broad isthmus including the granular sphere reduced to half its original diameter. Two hours later the granular sphere had melted in the isthmus, leaving behind what appeared to be a large oil globule and half a dozen smaller ones. The isthmus in the former time measured $\frac{1}{95}$ mm., at the later time $\frac{1}{98}$ mm.

Shortly afterwards, the isthmus elongated and contracted to $\frac{1}{50}$ mm. on the left, while the right half, retaining the oil globules, remained as thick as before. At the same time the animals became flattened at the opposite poles. The latter subsequently became depressed so that the animals assumed a reniform outline.

The isthmus now more rapidly narrowed and elongated, became a mere thread, and finally separated about one hour from the last two hours indicated.

The oil globules were retained in the right-hand individual, which, with the remaining projection of the isthmus, appeared broadly codiform in outline. In the left-hand individual all remains of the isthmus at once disappeared, and the animal appeared reniform in outline, but now contracting on the same side it assumed the buscuit form. The constriction rapidly increased, and in thirty minutes from the time of separation from the right-hand individual it divided into two separate animals presenting the ordinary appearance of A. sol. Thus this second division took place in an opposite direction from the first.

The right-hand individual, retaining the oil globules apparently unchanged, more slowly assumed the reniform outline, and then became constricted all around. The constriction elongated to an isthmus, in the centre of which were the oil globules. Three hours after the separation of the right-hand animal, the isthmus was narrowed to about half the diameter of the two new individuals which were about to be formed. At this moment other engagements obliged me to leave the examination of the animals. Six hours after, in the animalcule cage, I observed only half a dozen individuals of the A. sol.

MARCH 31.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

The following papers were presented for publication:—

"On Variations in Structure of Horns of Deer of the Genus Cariacus." By E. D. Cope, A.M.

"On the Ziphius of Nantucket." By E. D. Cope, A.M.

On report of the committees, the following papers were ordered to be published:—

REMARKS ON THE TERTIARY CLAY OF THE UPPER AMAZON, WITH DESCRIPTIONS OF NEW SHELLS.

BY T. A. CONRAD.

Professor Eug. W. Hilgard has sent me for examination a number of fossils collected on the Upper Amazon by Mr. Steere. The extraordinary character of this interesting group has made it one of more than ordinary attraction. The species and even many of the genera being limited to these deposits, we fail to find a point of comparison with other groups of fossils. Some naturalists have supposed from the look of freshness and the perfection of many specimens, that they may be of comparatively modern origin, but the clay in which they are imbedded is admirably fitted for their indefinite preservation. The clay is generally free from iron, and thus one source of injury is wanting. The colors of the shells are sometimes preserved in perfection, and even the epidermis of a few specimens of PACHYDON, and also portions of cartilage, but I do not regard these as evidence of very late deposition of the group. The colored markings of a cretaceous NERITINA from Mississippi, and on a univalve of the eocene of Alabama, as well as portions of cartilage in an eocene bivalve, all of which I have seen, might as well be considered evidence of late tertiary deposition of the beds in which they occur. Were the Pebas group of pliocene date, we should expect it to contain many recent species of the Lower Amazon, and especially AZARA, but as far as we yet know, such shells are absent. TRIQUETRA and HEMISINUS are characteristic genera of South American rivers, but the fossil species are not identical with living ones. Mr. Dall informs us that "many of the genera are exclusively marine," but I am sure no such genus was in the collection which he studied at the time. Only one doubtful genus of this character has been found in all the collections since made. The fresh-water shells consist of, 2 ANODONTAS, 2 of HEMISINUS, and 2 of TRIQUETRA, besides several land shells, while the estuary genera, MYTILOPSIS and NERETINA, might have lived in either fresh or brackish water. On the coasts of the Atlantic States of North America these two genera live in the latter. The only shell which might be supposed to be strictly marine is a NUCULANA, if it prove to be a

species of that genus. So partial a view of the hinge has been obtained that it cannot be certainly determined as indicating that genus. The shell described as TELLINA by Mr. Gabb is a young valve of PACHYDON *tenuis*. So that any certain evidence of a marine origin for the Pebas group is wanting.

Professor Woodward remarks that in the living analogue of PACHYDON, "AZARA or POTAMOMYA, we have just the evidence we need to argue upon" in respect to the nature of the habitat of the Pebas shells, and quotes Darwin's observations on AZARA *labiata*. Darwin in his "Geological Observations on South America" says, "On the northern bank of the great estuary of the Rio Plata, near Moldonado, I found at the head of a lake, sometimes brackish, but *generally containing fresh water*, a bed of muddy clay containing AZARA *labiata*," etc. This representation of the habits of that shell indicates, I think, those of the Pebas fossils, which may have inhabited a lake similar to that of Moldonado.

The following letter from Mr. Steere to Prof. Hilgard explains the position of the fossils:—

"I first saw Prof. Orton's fossil bed near Tabatinga. It is composed of horizontal beds of blue clay, separated by beds of dirty coal, that seems more like peat than coal. There seems to be nothing regular in these beds, thus differing apparently in thickness, and appeared in a distance of a few hundred yards. I have sent you fossils from these different localities, Pebas, Old Pebas, and Pichana. They are situated in relation to each other somewhat as follows: Pebas one mile from the mouth of the Ambyacú River, and Old Pebas two miles below, and Pichana perhaps fifteen miles from the mouth of the Ambyacú. The fossils from Pebas are 60 or 70 feet above the river level, while at Old Pebas they are at the water level, though the shell beds at Pebas may extend down, as the lower strata are covered by fallen and washed earth, leaving the fossil beds visible only at the top. The fossil beds appear to have been denuded irregularly and then covered with a bed of red and white clay and sand, much like that formed so plentifully on the Lower Amazon in some places. This shows in the river bank 30 feet thick, but at Pebas only 8 or 10. I made a rough section of the exposed beds at Pebas, with the following result—though the result I think is of little importance, the beds change so frequently.

Pebas.

8 feet red and white clay and sand.
20 feet blue clay, 4 feet of fossils.
6 inches coal.
15 blue clay. 3 feet of fossils.

"I noticed that the lower strata had less univalves and more bivalves than the upper. I have sent you some shells that I know are new, and bits of turtle shell, fish bones, coral, crustaceans, etc., which have not been noticed in the bed before."

I found no specimen of coral in this collection, nor in any other of the Amazon fossils.

Description of Shells of the Pebas Group.

PACHYDON, Gabb.

In this genus the species are very diverse in form, inequivalve, both beaks directed forward, spiral; the cardinal tooth of the left valve is covered in front throughout two-thirds of its length by a portion of the exterior layer of the valves, which is transversely striated, and resembles a wedge sunk into the base of the lunule, so as to define the tooth from the exterior when the valves are closed. In most species the prominent margin of the lesser valve fits into a groove, the lower margin of which is a well-defined lateral tooth. This character is entirely wanting in CORBULA, as well as the external view of the cardinal tooth. In *P. cuneata* this character is strongly marked. Mr. Gabb's name for this genus must be retained, because Stuchbury's PACHYODON, as well as Schumacker's, are superseded.

P. (Anisorhynchus?) dispar, Conrad, Pl. I., fig. 1.

Very oblique, subquadrangular, right valve concave above, with 2 diverging carinated lines from apex, one directed towards the ventral extremity, the other towards the anterior margin, left valve profoundly ventricose, with a well-marked groove anterior to the beak, directed somewhat obliquely backward to the ventral margin which is emarginate. The two outlines represent side views of right valve.

Six or seven specimens of this singular species are before me, and I supposed the valves belonged to two different species, so very remote in appearance they are from each other; but one specimen, a cast, occurs with both valves represented in connection.

It would hardly have been thought a CORBULA by those who insist on the group being referred to that genus, if no other species of PACHYODON had been found.

P. erectus, Conrad.

I have not the specimen originally figured, of this species, to refer to, and cannot say positively whether *P. altus*, Conrad, is identical with it. There is no form in the collection which would represent *P. erectus*.

P. altus, Conrad, Pl. I., figs. 4, 18

These represent the right or small valve of P. ALTUS in its young stage of growth. There are many specimens of this species in the collection, but not one form which I could refer to the preceding species.

P. cuneata, Conrad, Pl. I., fig. 3.

This figure represents an unusual form of this shell, which species is rare in the collection in comparison with *P. tenuis*, *obliqua*, or *erectus*, about 10 specimens in all.

Subgenus ANISORHYNCUS, Conrad.

One valve of this subgenus occurs in the collection, the principal distinctive character of which is the involution of the right valve. What gives peculiar interest to this shell is that it is closely related to *A. pyriformis*, Meek, which lived among *Unionidæ* in the eocene of Utah, and the subgenus unknown in later tertiary deposits. This is another instance of the belated character of the South American faunas, and favors the belief that the Pebas group is not of late tertiary origin.

P. (Anisorhynchus) cuneiformis, Conrad, Pl. I., fig. 19.

Pyriform, very inequilateral, ventricose anteriorly, with the submargin slightly convex, and the area before it depressed; posterior side elongated, somewhat sinuous or contracted, end acutely rounded; umbonal slope undefined.

This description applies to only one right valve, which is all in the collection. It is a moderately thick shell, and differs from most species of PLATYODON in wanting a prominent beak.

DRÉSSEINA, Vanbeneden.

Subgenus MYTILOIDES, Conrad. PRAXIS, H. & A. Adams.

D. scripta, Conrad, Pl. I., figs. 12, 16.

Triangular, elevated, ventricose anteriorly, compressed towards the posterior end; umbo sharply angulated anteriorly, anterior side flattened or concave; markings zigzag brown lines.

This species much resembles *D. polymorpha* in its colored markings. It is a much smaller species than the latter, and proportionally shorter or more elevated. It is sufficiently abundant to mark the estuary character of the bed in which the species lived.

Figs. 12 are young shells showing extremes of variation in form.

There is a small species of this subgenus living in the waters of Virginia, among the oysters planted in brackish waters; *D. leucophæata*, Conrad. (*D. Americana*, Recluz.)

ANODONTA, Cuvier.

A. pebasana, Conrad, Pl. I., fig. 5.

Rhomboidal, elongated, compressed; dorsal and ventral margins parallel; summit very small and acute, little prominent above the hinge line, and erect; distant from anterior end.

A single valve of this species is before me. It is only remarkable for its comparatively low elevation or height. There is a fragment of a much larger species in the collection, which may be *A. Batesii*, Woodward. The fragment I noticed as allied to MULLERIA, Woodward states may be an *Anodon*, but the extraordinary muscular impression renders that impossible.

TRIQUETRA, Klein. HYRIA, Lam.

T. longula, Conrad, Pl. I., fig. 10.

Subrhomboidal, slightly ventricose, elongated, scarcely alated, hinge and ventral margins nearly parallel; anterior margin slightly emarginate; dorsal line convex, ventral margin nearly straight; umbonal slope rounded except on the umbo, where it is subangular; umbo flattened, with longitudinal and transverse zigzag plications; posterior margin obliquely truncated; cardinal teeth of right valve, four, the anterior one elongated and compressed, rectilinear, two diverging teeth immediately under the apex, and a much less elevated linear oblique tooth between two anterior teeth; in the left valve two very oblique diverging teeth

anterior to the beak, and two or three very small direct teeth under the beak.

T. longula (Young), Conrad, Pl. I., fig. 13.

Rhomboidal, compressed, alated, anterior margin obliquely rounded; umbo slightly convex, plicated, the plicæ similar to the preceding, but the zigzag transverse ones wanting.

There are only fragments of this shell before me, and therefore the outline must necessarily be conjectural.

OSTOMYA, Conrad.

Thin, concentrically plicated; hinge with a spoon-shaped oblique fosset in the left valve, and a small tooth near the apex; right valve cartilage fosset very oblique, almost parallel with the hinge line.

O. papyria, Conrad, Pl. I., fig. 6.

Subovate, inequilateral, compressed, very thin, concentrically plicated, slightly sinuous anteriorly; ventral margin slightly emarginate anteriorly; umbonal slope undefined; posterior end subangular.

A very rare shell, of the family *Anatinidæ*. The fosset is very large in proportion to the size of the shell. This form of hinge would indicate a genus living in water more or less brackish. In one specimen the apicial tooth is tuberculiform, in the others acute with a slight channel anterior to it.

NUCULANA ? Link.

Plate I., fig. 2, represents the outline of a single specimen of a shell having the form and somewhat similar hinge of NUCULANA.

PLANORBIS, Guettard.

P. Pebasana, Conrad.

Discoid, depressed; volutions 3, convex, channelled along the suture, glossy; base concave, volutions rounded, separated by a deep channel; aperture round.

Four or five specimens of this very small species were found in a quantity of small shells and fragments of shells. They are as fresh-looking as living species. If some of these Pebas fossils were gathered, washed out of the clay on the shore of the Amazon, the collection might include recent species of the vicinity.

PACHYTOMA, Swainson.

P. tertiana, Conrad, Pl. I., fig. 11.

Pyramidamical, volutions 5, flattened or concave laterally, carinated at the suture and profoundly so at the sharp angle of the base; base slightly convex, subumbilicated, subcarinated behind the depression; basal margin slightly emarginate.

A few specimens were found in the detritis. It is with some doubt I refer it to PACHYTOMA, but I cannot compare it with any other genus known to me.

TOXOSOMA, Conrad.

Conical, polished, the aperture projecting, subovate, direct, peritome continuous; columella concave with a plait or tooth in the middle, not oblique; base rounded, subumbilicated.

T. eborea, Conrad, Pl. I., fig. 7.

Small, volutions 5, rounded; aperture angular above; last volution expanded; columellar tooth minute.

Found in company with the preceding shell. It is probably a land shell.

CIRROBASIS, Conrad.

Subcylindrical, with last volution free, aperture projecting, peristome continuous, mouth narrow, subovate, oblique.

C. venusta, Conrad, Pl. I., fig. 15.

Elongated, volutions 9, very slightly convex, the last volution straight on the side; a few volutions near the apex with a carinated line below the middle of each volution; angle of base subcarinated.

Only one specimen was found, and that in perfect preservation. The genus is probably terrestrial, allied to CYLINDRELLA.

LIOSOMA, Conrad.

Conical, polished; aperture subelliptical; columella with one plait in the middle; base entire.

L. curta, Conrad, Pl. I., fig. 8.

Volutions smooth, 4, slightly convex; columella conspicuously cut or indented above the plait, which is not oblique.

CYCLOCHEILA, Conrad.

Pyramidal, aperture circular, expanded labrum widely reflexed, columella flattened, subangular at base.

C. Pebasana, Conrad, Pl. I fig 17.

Volutions 5, with straight sides: last volution angular and carinated on the angle: base flattened: spire and mouth of nearly equal length, spire longest: lines of growth oblique.

HEMISINUS, Swainson.

H. Steerei, Conrad, Pl. I., fig. 14.

Turreted: volutions 6, convex, showing remains of 3 carinations on each one of the spire: last volutions having 4 revolving carinated lines, the upper one near the suture: sinus of labrum deep.

A single specimen occurs, much water-worn, almost obliterating the carinated lines of the spire.

EBORA, Conrad.

E. crassilabra, Conrad, Pl. I., fig. 9.

Notes.—LIRIS LAQUEATA, Conrad, appears to me to be a land shell allied to CYLINDRELLA and CLAUSILIA. There are, I think, five genera of land shells and three of fresh water, with four species of the latter. A few fragments of fish remains (Mylio-bates) were determined by Prof. Leidy, and there is an impress in the clay of nearly a whole crab. It is remarkable that no remains of plants have been found where delicate fresh-water and land shells have been drifted into these deposits. We may expect to find mammalian relics when the beds are more thoroughly explored, and they would be likely to indicate their geological age.

ON THE ANATOMY AND LINGUAL DENTITION OF ARIOLIMAX AND OTHER PULMONATA.

BY W. G. BINNEY.

I have already, in connection with my friend Mr. T. Bland, given a description of the external characters of *Ariolimax* (Ann. N. Y. Lyc., N. H. X. 297, 1873). I now propose to describe such of its internal organs as I have been able to study.

I have examined one specimen of *Ariolimax niger*, J. G. Coop., preserved in spirit, belonging to the state collection of California, labelled and presented by Dr. Cooper, and in all respects an authentic type. Agreeing with this type I have other specimens from various California localities, so that I believe the species to be well established and generally distributed along the coast of California.

From the Museum of Comparative Zoology at Cambridge, Mr. Anthony has sent me a specimen, long preserved in alcohol, marked from San Mateo, California. For reasons given below, I am inclined to consider this the form described by Dr. Cooper as *A. Californicus*. I have had the opportunity of examining another specimen of this form, received from Mr. Stearns, who collected it near San Francisco.

From Mr. Henry Hemphill I have received a specimen from San Mateo Co., California, which presents most decided specific differences from the last-mentioned form, especially in its genitalia. Having considered the last-mentioned form as *A. Californicus*, I am forced to consider this as *A. Columbianus*, the only remaining described species. It must be borne in mind, however, that I have never compared it with specimens from more northern regions, whence the species was originally described. The large number of specimens formerly preserved in the Smithsonian, tabulated in Land and Fr. w. Shells, Part I. p. 281, were destroyed at the fire in Chicago, and I have been unable to obtain elsewhere any specimens from Oregon or Washington Territory, which I can refer to the true *Columbianus*.

In treating these various forms, I have abstained from giving any description of their exterior markings. Such description would be unreliable, as the specimens have been long preserved in

where the flagellum commences. The retractor muscle is inserted half way between the vagina and the entrance of the vas deferens. Opposite the mouth of the penis sac is a small sac-like organ, probably a dart sac or vaginal prostate.

Helix Mitchelliana, Lea (*Mesodon*), pl. III., fig. III.

The genital system is long and narrow. The oviduct is greatly convoluted. The penis sac is long, stout, cylindrical, with a bulb-like expansion at its apex, at which point both vas deferens and retractor muscle are inserted. The genital bladder is lengthened, ovate, not much larger than its duct, which is short, and enters the vagina below the middle of its length.

Helix reticulata, Pfr. (*Arionta*), pl. III., fig. II.

The specimens examined have a very globose shell. The ovary is brownish below, yellowish above. The epididymis and testicle are salmon colored. The oviduct is white, the prostate salmon. The genital bladder is small, oval, with an extremely long duct, which has a flagellate branch. The duct enters at the lower end of the vagina. The penis is narrow, cylindrical, extremely long, with a flagellate extension. The retractor muscle is inserted beyond the middle of the length of the penis, the vas deferens at the commencement of the flagellum. There is a stout long cylindrical vaginal prostate, whose apex is extended into a flagellum, which shortly becomes bifurcate, there being a bulb-like expansion on each branch just beyond the bifurcation.

In some individuals the bulb-like expansions are still larger and stouter than in the figure. The cylindrical extension of the vaginal prostate is abruptly truncated, the two flagella entering near the end, not at the extreme terminus.

Helix Roemeri, Pfr. (*Mesodon*).

The genitalia are figured on pl. IV., fig. V. The oviduct is scarcely convoluted. The genital bladder is large, oval, with a long, large duct. The penis sac is short, stout, of about equal breadth throughout, ending in a stout oval bulb, into which the vas deferens enters. The retractor muscle is inserted above the entrance of the vas deferens.

The specimen examined was collected in Bosque County, Texas, by Mr. Hugo W. Ericsson.

Helix appressa, Say (*Triodopsis*).

The genitalia are figured on pl. IV., fig. IV. The ovary is long

tion towards the extreme end of the tail. In the form I have referred to *A. Columbianus*? the pore was quite different from this, as seen in my figure B of plate II. In this the erect portion of the pore is entirely wanting, the carinated body being arched regularly down to, and overhanging the foot. The longitudinal gutter-like pore is, however, plainly visible. In the two specimens of the form I have referred to *A. Californicus*, the body is also arched down to, and overhangs, the foot. On the tail, corresponding to the gutter-like pore of the last-mentioned form, there was no sign of any pore, but in its place the flesh was sponge-like, without the markings which are found on the neighboring portions of the foot. It may be, therefore, that in these specimens the mucous pore was contracted or closed. No doubt it exists in the living animal.

Of the internal anatomy I have examined the nervous system in both *A. Californicus* and *A. Columbianus*? The ganglia present the usual three sets, all globular in form, and so crowded together in the subœsophageal and supercesophageal as almost to form a continuous chain around the buccal mass.

In these same two forms, also, I have examined the circulatory and respiratory organs. Within the respiratory cavity is a large, spongy, ear-shaped organ, attached only at one point to the roof of the chamber. This, I suppose to be the renal organ, surrounding, and indeed inclosing, the heart, though it is not so arranged in any of the genera described by Dr. Leidy. In *Arion hortensis* he describes the nearest approach to such an arrangement.

I have examined the digestive system of all the forms, and figured that of both *A. Californicus* and *Columbianus*. In the latter, plate II. fig. D, F, the buccal mass (1) is large and round, the salivary glands (4) short and broad; the stomach (5) long and large, with a decided constriction at its middle, and the usual cul-de-sac (6) at its extremity, at which point the biliary ducts (7, 7) enter; from this the stomach passes into the intestine (8), which proceeds first forward almost to the œsophagus, thence proceeds backward to the extreme rear of the general cavity of the body, and again forward to below the respiratory cavity, into which it penetrates upwards as the rectum (9), and through which it passes to the anus, whose position is described above. The intestine in its whole course winds among, and is imbedded in, the

various lobes of the liver, which latter organ is arranged as usual in *Limax*, *Arion*, etc.

In *A. Californicus* (plate XI. fig. E), there is a difference in the arrangement of the stomach. Before reaching the cul-de-sac (6), the stomach is greatly constricted, and the cul-de-sac runs at right angles with the stomach in an erect position, not lying on its side as I have represented it, in order to show the connection between it and the anterior portion of the stomach, which connection was entirely concealed by the cul-de-sac in its upright position. The extreme length of the digestive system is three times that of the whole body of the animal, at least in its contracted state.

The jaw in all the forms of *Ariolimax* is quite thick, dark horn-colored, arcuate; ends but little attenuated, blunt; anterior surface with stout ribs, denticulating either margin. I have figured the jaw of *A. Columbianus*? (plate II. fig. H) which has about twelve ribs. In *A. Californicus*, from Mr. Anthony, there were thirteen ribs to the jaw; fourteen in Mr. Hemphill's specimen of the same. In *A. niger* Dr. Cooper describes about twenty, but in one specimen I found but eight. In Land and Fr. w. Shells, I. p. 280, I have figured a jaw of the true northern form with eighteen ribs.

The pouch of the lingual membrane is shown in plate II. fig. D, 5. The membrane is as usual in the *Helicidæ*, with tricuspid central, bicuspid lateral, and quadrate marginal teeth showing simply a modification of the laterals. In L. and Fr. w. Shells, I. p. 280, I have figured the lingual membrane of the true northern *A. Columbianus*. The marginal teeth are there shown to have one long denticle and a small, subobsolete side denticle. This form of marginal teeth I have found in the form I have referred to *A. Columbianus*? (see plate II. fig. E). Also in one of Dr. Cooper's types of *A. niger* (plate XI. fig. A), and in both the specimens of *A. Californicus* (plate XI. fig. G). This form of marginal tooth may therefore be considered characteristic of the genus, though in one specimen supposed to be *A. niger*, I noticed marginal teeth with the outer cusp much more developed and bifid, and figured them in Ann. Lyc. N. H. N. Y., x. pl. xiii. fig. 1. In plate XI. fig. B, I have given the central and the adjoining lateral teeth of *A. niger*. In fig. F, the central and one adjoining lateral of *A. Californicus*.

There is no retractor muscle to the buccal mass in *A. Califor-*

nicus and *A. Columbianus*?, but a very stout, broad one to the whole head, attached to the outer integument, below the buccal mass, and running along some distance on the floor of the general visceral cavity, to which finally it becomes attached.

In describing the genital organs I have used the terms applied to the various organs by Dr. Leidy in the first volume of my father's work on "The Terrestrial Mollusks of the United States." Each form examined presented differences in these organs. They all agree, however, in having a very large ovary.

On opening the body of *A. niger* (plate XI. fig. c), the genitalia are found in the usual place, the testicle lying quite at the rear of the visceral cavity near the extreme point of the upper lobes of the liver, hardly imbedded in it, connected to the ovary by a long epididymis (2). The testicle (1) is globular in form, composed of black, aciniform cæca. It contrasts in color with the dirty white of the liver. Color, however, I have not found constant in the internal organs of land shells preserved in spirits. The above described arrangement of the testicle is as usual in *Limax*, *Arion*, and other slugs. It forms an excellent specific character for *A niger*, the position of the testicle being quite different in *A. Californicus* and *A. Columbianus*?, as will be seen below. The epididymis (2) is long, convoluted at the end nearer the ovary. The accessory gland is shown in 3. The ovary (11) is large, yellowish. The oviduct (8) and prostate (4) show no unusual characters. The genital bladder (9) is large, oval, with a short duct (16). The penis is in a short, stout sac (5), which has a bulb-like swelling at its upper extremity, where the vas deferens (7) enters. The latter organ has nothing of peculiar interest. A vaginal prostate, or perhaps dart sac, is shown in 13. The external orifice is described above (p. 34).

The genital system of *A. Californicus* is figured in D of plate XI. The testicle does not lie far away, imbedded in, or resting on, the upper lobes of the liver, but lies close against the ovary, in the semicircle formed by the recurving of the apex of the ovary upon itself. In this respect, the position of the testicle is different from that of most slugs, and affords an excellent specific character. The testicle (1) is kidney-shaped as it is covered by its investing membrane. It appears to consist of closely bound fasciculi of short, white, tubular, not aciniform cæca. The epididymis (2) is short and still more shortened by its excessive

convolution. The accessory gland is shown in 3, partially imbedded in the ovary. The ovary (11) is large and distinctly lobulated. The oviduct (8) is narrow, very long, greatly convoluted. From the testicle to about the middle of the course of the oviduct is a stout thread-like organ, of unknown use to me, either a muscle, nerve, or duct. It is not figured in my plate, as I am not certain of its forming part of the genital system. The genital bladder (9) is oval, large, with a short, stout duct (16). The penis is inclosed in a long tapering sac (5), terminating in a decided flagellum (15), in which I detected no capreolus. On the end of the flagellum is a large, globular bulb. The retractor muscle of the penis is attached to the roof of the general visceral cavity, below the pulmonary chamber. It joins the penis at the commencement of the flagellum. The vas deferens (7) is peculiar. It leaves the prostate gland (4) as usual, runs alongside of the vagina to the base of the penis, thence runs upwards, swelling to an enormous extent, so as to equal the breadth of the penis, then again becomes gradually reduced to its former size until, as the most delicate thread, it enters the penis at the end of the flagellum below the bulb. The penis did not appear in the animal extended as drawn in the plate, but was twice recurved upon itself. There is also a vaginal prostate (13), large, ear-shaped, close to the exterior orifice of the female organs, which, with that of the male, is described above (p. 34).

On plate II. fig. c, I have figured the genitalia of *A. Columbianus*? which also has a very large ovary (11) against which the testicle (1) lies as in the preceding form. The ovary is so large as to take up one-half of the entire visceral cavity, extending completely across the body, resting on the floor of the cavity, its ends recurved upwards so as to rest upon the liver on the upper surface of the viscera. The body of the animal externally is swollen by the large size of the ovary. The oviduct (8) is narrow, long, greatly convoluted, ending in an extremely long, convoluted vagina. The genital bladder (9) is oval, large, with a short, stout duct (16). The vas deferens (7) unlike that of the preceding form, is as usual in the land shells. It enters the penis (5) at its summit, opposite the retractor muscle (6). The sac of the penis is very stout, long, cylindrical. The external orifice is described above (p. 34).

Zonites lævigatus, Pfr., pl. III., fig 1.

I have examined numerous specimens, but have some hesitation in giving my figure and description as absolutely perfect. I had great difficulty in dissecting the species.

The ovary is short and vagina long. The genital bladder with its duct forms a short cylindrical sac-like organ, opening near the base of the vagina, and tapering at the apex. The penis sac is long, cylindrical, larger at its apex where it receives the vas deferens. At its base the penis sac has its opening into the vagina with a short stout organ (fig. 13) with rounded apex, where a retractor muscle seems to be attached. This organ may be a dart sac or some form of prostate gland.

Hemphillia glandulosa, Bl. and Binn., pl. III., fig. v. vi.

The testicle is composed of a large globular mass of aciniform cæca. It lies loosely upon, not imbedded in, the upper lobes of the liver. The ovary and oviduct are as usual. The genital bladder is globular, very large, on a short stout duct, entering the vagina near its base. The penis sac is long, cylindrical, larger towards its apex, where both the retractor muscle and vas deferens enter.

In several specimens examined, the penis sac appeared somewhat different. It had a large globular bulb (5*a*) at its apex. The vas deferens (7) entered beyond the middle of the length of the sac (5); it was greatly swollen (5*b*) before entering the sac, for a distance equalling about one-half of the length of the sac. At the commencement of this swelling the retractor muscle (6) was inserted. This form of penis sac is figured in fig. vi.

The balance of the anatomy of *Hemphillia* seems to be as in the other slugs.

Helix Kelletti, Forbes (*Arionta*), pl. III., fig. iv. The Catalina Island form.

The ovary is light yellow. The oviduct is white. The genital bladder is light yellow. The prostate is large and yellow.

The whole genital system is long and narrow. The genital bladder is small, globular, on an extremely long and delicate duct which enters the vagina at its upper end. The duct just below the bladder receives a branch duct, very long, flagellate, three times the diameter of the duct itself. The penis sac is long, stout, cylindrical, tapering towards its apex and prolonged into a very long delicate flagellum. The vas deferens enters at the point

where the flagellum commences. The retractor muscle is inserted half way between the vagina and the entrance of the vas deferens. Opposite the mouth of the penis sac is a small sac-like organ, probably a dart sac or vaginal prostate.

Helix Mitchelliana, Lea (*Mesodon*), pl. III., fig. III.

The genital system is long and narrow. The oviduct is greatly convoluted. The penis sac is long, stout, cylindrical, with a bulb-like expansion at its apex, at which point both vas deferens and retractor muscle are inserted. The genital bladder is lengthened, ovate, not much larger than its duct, which is short, and enters the vagina below the middle of its length.

Helix reticulata, Pfr. (*Arionta*), pl. III., fig. II.

The specimens examined have a very globose shell. The ovary is brownish below, yellowish above. The epididymis and testicle are salmon colored. The oviduct is white, the prostate salmon. The genital bladder is small, oval, with an extremely long duct, which has a flagellate branch. The duct enters at the lower end of the vagina. The penis is narrow, cylindrical, extremely long, with a flagellate extension. The retractor muscle is inserted beyond the middle of the length of the penis, the vas deferens at the commencement of the flagellum. There is a stout long cylindrical vaginal prostate, whose apex is extended into a flagellum, which shortly becomes bifurcate, there being a bulb-like expansion on each branch just beyond the bifurcation.

In some individuals the bulb-like expansions are still larger and stouter than in the figure. The cylindrical extension of the vaginal prostate is abruptly truncated, the two flagella entering near the end, not at the extreme terminus.

Helix Roemeri, Pfr. (*Mesodon*).

The genitalia are figured on pl. IV., fig. V. The oviduct is scarcely convoluted. The genital bladder is large, oval, with a long, large duct. The penis sac is short, stout, of about equal breadth throughout, ending in a stout oval bulb, into which the vas deferens enters. The retractor muscle is inserted above the entrance of the vas deferens.

The specimen examined was collected in Bosque County, Texas, by Mr. Hugo W. Ericsson.

Helix appressa, Say (*Triodopsis*).

The genitalia are figured on pl. IV., fig. IV. The ovary is long

and narrow. The epididymis is very long, convoluted at the end nearer the oviduct. The last-named organ is not much convoluted. The prostate is scalloped along its edges. The genital bladder is globular, small, with a long, small duct. The sac of the penis is extremely long, ribbon-like, one and one-half as long as the oviduct. The vas deferens enters its apex.

The long ribbon-like sac of the penis resembles that figured by Dr. Leidy (Terr. Moll. U. S. I.), of *H. Sayii*. There is but little resemblance to the genitalia of *H. palliata*, so nearly allied by its shell.

The specimens examined were collected in eastern Tennessee, by Miss Law.

Helix Nickliniana, Lea (*Arionta*).

The genitalia are figured on plate IV. fig. III. The ovary is yellow, long, narrow, concave on one side, convex and carinated on the other. The accessory gland of the epididymis is composed of long, white cæca. The oviduct is extremely long, narrow, convoluted. The genital bladder is globular, small, with an extremely long duct, to which is added an accessory duct or branch, almost as long as the oviduct. This branch joins the duct near its end. It is thicker than the duct. The duct enters the vagina at its upper part. The penis sac is long, cylindrical, small, almost equalling in length the oviduct and ovary united. The retractor muscle is inserted at about the middle of its length, it is attached to the diaphragm; the vas deferens enters about three-fourths of its length; beyond the vas deferens is a flagellate extension. The vagina is long and narrow; near its base, opposite the entrance of the sac of the penis is a stout, cylindrical, long, hollow, vaginal prostate, gradually tapering at its apex, and extended into a delicate tube, which soon becomes divided into two long flagella. Just beyond the division, on each flagellum, is a stout bulb-like enlargement.

This complicated form of genitalia, hitherto unnoticed in American species, has been noticed in European species.

Patula strigosa, Gould, pl. IV., fig. II.

Represents the genitalia of a Salmon River specimen. The testicle, as usual, was in the summit of the upper lobe of the liver. The epididymis is long, convoluted in its half nearer the testicle. The accessory gland is composed of several long, black cæca. The oviduct is sac-like, not convoluted, containing eight embryonic

Nevilli. We have elsewhere described the dentition of *G. sulcata*, Müll. (Ann. N. Y. Lyc. N. H., x. 222).

No jaw was found in any of the above, nor in *Ennea clavulata*, Lam. This last species is placed in s. g. *Gulella* by von Martens. There were five embryonic shells in the oviduct, proving the species to be viviparous. The dentition is the same as in *Geneopira*. There appears to be a median tooth of same form as the laterals.

Of the genus *Nanina* (using the name in the same sense as von Martens in die Helicen.), there were several species. All have the locomotive disk, the caudal pore with overhanging horn-like projection, the smooth jaw with median projection, and the lingual dentition of the genus, *i. e.*, centrals tricuspid, laterals bicuspid, marginals aculeate, bluntly bifid. Such are *N. Caldwelli*, Benson; *N. Barcoxis*, Barclay = *semicerina*, Morelet; *N. argentea*, Rve.; *N. implicata*, Nevill; *N. stylodon*, Pfr., put in Helix (*Erepta*) by von Martens. Entirely different in the dentition is another species, *N. phlygrina*, Morelet, though the species agrees in other respects with the above-named. The membrane is very broad, the teeth exceedingly numerous, arranged in oblique rows. The centrals, which I am confident of having seen, are small, narrow, high. The other teeth are the same in form to the edge of the membrane. They appear to have the usual aculeate form of the marginal teeth in *Nanina*, but instead of narrowing towards the cutting point, they are broadly and obliquely truncated, reflected, and minutely denticulated. This lingual membrane is also figured by Semper (Phil. Archip., pl. vi. f. 35), but his figures give more the impression of the usual *Nanina* marginals with denticulated side and bifid points. The teeth are, however, so exceedingly numerous and small, it is very difficult to understand them.

Elsewhere (Ann. N. Y. Lyc. N. H., x. 170) we have described the lingual of the following Mauritius species: *Nanina inversicolor*, *leucostyla*, *rufizonata*, *militaris*. I have examined the genitalia of *N. inversicolor*. The oviduct is long, narrow, sac-like; the genital bladder is hardly smaller than its long wide duct; the penis sac is long, extended into a flagellum, receiving the vas deferens near its apex, beyond it having a bulb-like termination; the vas deferens is greatly swollen at its middle portion, and near the base of the oviduct has a long flagellate appendix.

The subœsophageal ganglia consist apparently of six closely agglomerated globules. There are two simple globules to the stomacogastric ganglia. The genital system (pl. VIII. fig. 5) is quite simple, presenting no accessory organs. The testicle is composed of six or seven fasciculi of long cæca, which massed together in a globular form equal the length of the oviduct. This enormous development of the testicle is the peculiarity of the genital system, and no doubt will prove a reliable specific, but not generic, character. The epididymis is long, convoluted at its middle portion. The oviduct is long, narrow, not convoluted. The vagina is about one-fifth the length of the oviduct; it is swollen greatly at the entrance of the penis. The genital bladder is small, globular; its duct is narrow, longer than the oviduct, and enters the vagina at the upper fourth of its length. The penis sac is short, stout, blunt at apex, where the vas deferens enters and where the retractor muscle is also inserted.

In the paper referred to above we hesitated to decide upon the generic position of this species, leaving it temporarily in *Pellicula* of Fischer (not of Heynemann, which is *Omalynx*). Since that time I have become acquainted with the jaw of *Amphibulima*, and find it to be of the same type as in *appendiculata*. I would, therefore, suggest that this species belongs to *Amphibulima*. It is true its lingual dentition (see pl. VIII. fig. 6) more closely resembles that of *Simpulopsis sulculosa* as far as centrals, and perhaps laterals, are concerned; but in the marginals, as described in *S. sulculosa* and *S. Portoricensis*, the resemblance ceases. Moreover, the jaw of *Simpulopsis* is described as quite different by Shuttleworth. The species under consideration cannot, therefore, be placed in *Simpulopsis*. It appears, at all events, that the shell in this group is an unreliable guide to generic position.

It must be borne in mind that I here describe the anatomy of the shell figured by us (l. c.). We believe it to be *Succinea appendiculata*, Pfr. Fischer bases his genus *Pellicula* on *Succinea depressa*, Rang. He does, indeed, place *S. appendiculata*, Pfr., in the synonymy of his species, but our specimens of *appendiculata* could never be the same as Fischer's specimens of *depressa*. His had a jaw with nine decided ribs, denticulating the cutting edge, and teeth[1] of the usual form of *Helicinæ*, quite different from what

[1] In Fischer's plate the references to teeth of *Omalonyx unguis* and *Pellicula depressa* are reversed.

we find in our *S. appendiculata.* His species and ours are therefore distinct.

Pellicula convexa, Martens (*Succinea*), is quite a distinct species, and belongs to the genus *Omalonyx*, as shown by Heynemann's figure of the jaw (Mal. Blatt., xv.).

I give also figures of the central and lateral teeth of our species (pl. VIII., fig. 6).

Amphibulima patula, Brug.

I have elsewhere described, in connection with Mr. Bland, the jaw and lingual membrane of specimens of this species from St. Kitts and Dominica (Am. Journ. of Conch., VII. 186, pl. xvii., f. 1, 2; Ann. Lyc. N. H. and N. Y., x. 225, pl. xi., f. 8). Lately the question of identity of these shells with the Guadeloupe *patula* has been raised (see Journal de Conchyliologie, XXI. 12). I have, therefore, again carefully examined the lingual membranes previously described to learn if they give any difference worthy to be considered of specific value. I have figured teeth from each lingual membrane (pl. VII.). I regret not having had the opportunity of examining Guadeloupe specimens also, but have never been able to receive the latter with the animal; indeed it seems to be now found subfossil only. I can only treat the question of the identity of the St. Kitts and Dominica forms, not their identity with Guadeloupe forms.

It will be seen that the Dominica form has sharper cutting points to the large cusps of its central and lateral teeth than that of St. Kitts. Fig. B shows a group of laterals of the former, in which some variation from the pointed shape is indeed shown, but no decided tendency that way. On the other hand, the laterals, from the St. Kitts form, show great constancy in the square truncation of the cutting points.

The teeth of the St. Kitts form are broader in proportion to their length than those of Dominica, have a greater curve in their outlines, and more developed side cusps, which overlap the median cusps.

The Dominica lingual in the only row counted had 87–1–87 teeth. A row of the St. Kitts form 57–1–57. The marginal teeth of the St. Kitts form show a greater tendency to splitting into sharp denticles on the cutting cusps than those of Dominica.

It cannot be denied that certain variations may be noticed in the two lingual membranes. I believe, however, that these differ-

ences are not such as suggest specific distinction, especially as the shell furnishes no grounds for doubting the specific identity of the forms. Nor by the shell alone does there seem to be two species.

Mr. Bland has given a detailed account of the species in Journal de Conchyliologie, XXI. 342, October, 1873.

Amphibulima rubescens, Desh.

Mr. Bland and myself are indebted to Governor Rawson for specimens preserved in spirits of *Succinea rubescens*, Fér. of Martinique.

On examination of the jaw and lingual membrane, I found the species to be no *Succinea*, but an *Amphibulima*, in which genus it is placed by H. and A. Adams (Gen. Rec. Moll.), and by Beck (Index), though Pfeiffer treats it as a *Succinea*, and von Martens catalogues it in *Succinea*, s. str. (See note 1 to p. 345 of Journ. de Conch., Oct. 1873, 3d series, XIII.)

The external appearance of the animal has nothing peculiar. The head appears blunt and short, the tail long and pointed, without any mucus pore. There is no distinctly marked locomotive disk to the foot, over the whole breadth of which the transverse muscles pass. The reticulations of the surface of the animal seem large and coarse in proportion to its size. As far as can be judged from alcoholic specimens, the tentacles and eyepeduncles seem short and stout. The respiratory and anal orifices are under the mantle on the right side. The external orifice of generation is behind the right eyepeduncle.

On opening the animal from above, the generative system is found as usual, lying on the right of the animal. It occupies the whole of the visceral cavity in front of the shell, lying upon the stomach. The testicle (see plate VIII., fig. 4) is a globular mass composed of long cæca. It lies imbedded in the liver. The epididymis is not greatly convoluted. It passes between the stomach and intestine, at the cul-de-sac of the former, on its way to the ovary. The latter organ is, as usual, tongue-shaped. The oviduct is long and greatly convoluted. The vagina is short, receiving at its lower portion the long duct of the small, globular genital bladder. The penis enters the vagina close to the common opening. The sac of the penis is not long, is stout, cylindrical, blunt at apex, where it receives the vas deferens, just above the insertion of the retractor muscle. There are no accessory organs. The genital system is very much the same in its general arrange-

... cusps; marginals with oblique bluntly rounded broad cusps. ... larger, one bluntly bifid.

Eulix punctata (*nec denticulata*), Born. (*Dentellaria*).

Martinique. Governor Rawson.

Jaw stout, arched, ends blunt, cutting edge with a blunt median projection, one stout, decided rib on the centre of the jaw, ... obsolete less developed separate ribs at each side of it.

Lingual membrane long and narrow (plate IX., fig. 8). Centrals ... narrow with long, stout median cusps, bearing a point ... nearly to the base of the plate; side cusps subobsolete. ... like the centrals, but unsymmetrical. Marginals low, ... quadrate, with one very long, broad, bluntly bifid, ... denticle, and one smaller, bluntly rounded, side denticle.

Spiraxis navicula, Rang (*Dentellaria*).

Martinique. Governor Rawson.

Jaw thick, arched, ends blunt; cutting margin with an obtuse ... projection. One central, stout rib, denticulating either ...

Lingual membrane, as usual in *Dentellaria* (see *H. punctata*, ... above.

Helix formosa, Fér. (*Dentellaria*).

Antigua. Received mounted from the late Mr. Robert Swift.

Jaw arched; ends blunt; several strong, transverse lines of reinforcement, but no ribs; a median projection to cutting edge.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *punctata*, Born.)

Helix badia, Fér. (*Dentellaria*).

Received mounted from Mr. Swift.

Jaw stout, arched; ends blunt, with about eight decided ribs.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *H. punctata*, Born.)

Pupa rupicola, Say

Coll. A. G. Wetherby.

Jaw low, wide, slightly arcuate; ends but little attenuated, blunt; no median projection to cutting edge.

Lingual membrane as usual in the genus. (See figures of that of *Bifidaria pentodon*, and *badia* in L. & Fr. w. N. A., I.) The ... on the laterals, however, are very much stouter. There are ... laterals.

fig. 8.) The lingual membrane has also the same general arrangement as in that genus, with specific differences from that of *A. patula* (see plate VII., fig. A–C), especially in the widely expanded, blunt median cusp, and in the *Succinea*-like cutting away of the lower margin of the teeth.

The nervous ganglia are as usual in the *Geophila*, forming a continuous ring in the supraœsophageal, and grouped together in one mass in the subœsophageal set.

Plate VIII., fig. 3, gives the central and adjacent lateral teeth, with marginals at different intervals to the edge of the membrane.

The notes we have given above will enable a full generic description of the genus *Amphibulima* to be drawn.

Gonospira and Nanina, from Mauritius.

Having received from the Museum of Comparative Zoology at Cambridge a number of specimens in alcohol of Mauritius species, collected by Consul Pike, we are able to give the following notes on them.

Gonospira. There were several species of this and the allied subgenera, allowing an examination of their anatomy. The soft parts of the animals are colored red. The species especially examined are *G. Newtoni*, H. Ad., and *G. palanga*, Fér. There seems nothing in the anatomy different from what is usual in the land shells. The genitalia of *G. Newtoni* are figured on plate VIII., fig. 7. There are no accessory organs. The genital bladder is long, oval, with a long, narrow duct. The penis sac is stout, long, receiving the vas deferens at its summit, at which point, also, the retractor muscle is inserted. The vagina is long, the oviduct not convoluted. The ovary tongue-shaped as usual. The epididymis is short, the testicle as usual lies in the liver.

G. palanga has a similar genital system. There appears no locomotive disk and no caudal pore.

The lingual membrane of the genus has been photographed by Mr. Bland and myself (Am. Journ. of Conch., v. pl. xi. fig. 1). All the species now received have similar dentition. There is, however, a difference in the number of teeth in each transverse row. I counted about 37–1–37 in *palanga;* 6–1–6 in *G. Newtoni;* 12–1–12 in *G. mauritiana*, Morelet; 25–1–25 in *G. modiolus*, Fér. (*Gibbulina*, v. Martens). The dentition of this species is also described by Semper (Nachr. Mal. Ges., II. 103). 21–1–21 in *G.*

Nevilli. We have elsewhere described the dentition of *G. sulcata*, Müll. (Ann. N. Y. Lyc. N. H., x. 222).

No jaw was found in any of the above, nor in *Ennea clavulata*, Lam This last species is placed in s. g. *Gulella* by von Martens. There were five embryonic shells in the oviduct, proving the species to be viviparous. The dentition is the same as in *Gonospira.* There appears to be a median tooth of same form as the laterals.

Of the genus *Nanina* (using the name in the same sense as von Martens in die Heliceen), there were several species. All have the locomotive disk, the caudal pore with overhanging horn-like projection, the smooth jaw with median projection, and the lingual dentition of the genus, *i. e.*, centrals tricuspid, laterals bicuspid, marginals aculeate, bluntly bifid. Such are *N. Caldwelli*, Benson; *N. Rawsonis*, Barclay = *semicerina*, Morelet; *N. argentea*, Rve.; *N. implicata*, Nevill; *N. stylodon*, Pfr., put in Helix (*Erepta*) by von Martens. Entirely different in the dentition is another species, *N. philyrina*, Morelet, though the species agrees in other respects with the above-named. The membrane is very broad, the teeth exceedingly numerous, arranged in oblique rows. The centrals, which I am confident of having seen, are small, narrow, high. The other teeth are the same in form to the edge of the membrane. They appear to have the usual aculeate form of the marginal teeth in *Nanina*, but instead of narrowing towards the cutting point, they are broadly and obliquely truncated, reflected, and minutely denticulated. This lingual membrane is also figured by Semper (Phil. Archip., pl. vi. f. 35), but his figures give more the impression of the usual *Nanina* marginals with denticulated side and bifid points. The teeth are, however, so exceedingly numerous and small, it is very difficult to understand them.

Elsewhere (Ann. N. Y. Lyc. N. H., x. 170) we have described the lingual of the following Mauritius species: *Nanina inversicolor*, *leucostyla*, *rufizonata*, *militaris.* I have examined the genitalia of *N. inversicolor.* The oviduct is long, narrow, sac-like; the genital bladder is hardly smaller than its long wide duct; the penis sac is long, extended into a flagellum, receiving the vas deferens near its apex, beyond it having a bulb-like termination; the vas deferens is greatly swollen at its middle portion, and near the base of the oviduct has a long flagellate appendix.

Glandina semitarum, Rang. (*Varicella*).

Martinique, Governor Rawson.

Lingual membrane as usual in *Glandina*. There are about 30–1–30 teeth. The central is long and narrow, sharply pointed.

Glandina Phillipsi, Adams (*Varicella*).

Jamaica.

Lingual membrane as in last species.

Helix clausa, Say (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw as usual in the subgenus, with about 10 stout, separate ribs, denticulating either margin.

Lingual membrane long and narrow. Teeth about 41–1–41. Centrals and laterals (about 11 of the latter), as usual in the subgenus (see fig. of those of *H. Sayi*, L. and Fr. w. Shells, I. 154, fig. 265). Marginals quadrate, with one extremely long, oblique denticle, as in *H. thyroides* (l. c. fig. 252, p. 148). Some of the extreme marginals are notched or obsoletely bifid at their point.

The penis resembles that of *H. thyroides* as figured by Dr. Leidy in Terr. Moll. U. S., I.

Helix Downieana, Bland (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw ribbed as usual in the subgenus. Lingual membrane as usual in the subgenus (see fig. 265 of L. and Fr. w. Shells, N. A., I). Marginals with one long, oblique, bluntly bifid inner denticle, and two short, blunt outer denticles.

Helix Wetherbyi, Bland (*Mesodon*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw and lingual membrane as usual in the subgenus (see *ante*, *H. clausa*), the former with about 18 ribs, the latter with marginals peculiar for the great development of the inner blunt denticle, the outer being short and blunt. Plate V., fig. 17, 18.

Helix Edvardsi, Bland (*Stenotrema*).

Whitley Co., Kentucky. A. G. Wetherby.

Jaw as usual in the subgenus (see L. and Fr. w. Shells, N. A., I), with about 13 broad, crowded ribs, denticulating either margin.

Lingual membrane as in *H. hirsuta* (l. c. 119, fig. 197). Centrals tricuspid, laterals bicuspid, marginals wide, low, with one

inner, long, oblique, bluntly bifid denticle, and two outer, short, blunt denticles.

Helix angulata, Fér. (*Eurycratera*).

Porto Rico. From the late Mr. Robert Swift.

Jaw stout, dark claret-colored, low, wide, ends blunt; about 7, very wide, crowded, decided ribs, bluntly denticulating either margin.

Lingual membrane as in the *H. crispata* (plate X., fig. 9), as far as the general arrangement of the teeth, but there are decidedly developed points to the side cusps of both centrals and laterals; we have therefore figured it (plate IX., fig. 5).

Helix Texasianna, Mor. (*Polygyra*).

Bosque Co., Texas. Mr. H. W. Ericsson.

Jaw wide, low, slightly arcuate, ends blunt, with 10 decided ribs, denticulating either margin.

Lingual membrane (plate V., fig. 1) as usual in the subgenus. Centrals and laterals with a plate about as wide as high, the former tricuspid, the latter bicuspid, cusps long and slender, with long, sharp points. Marginals low, wide, multidentate, the two inner denticles long, the several outer denticles short and slender. Of the same type as figured by us for *H. auriculata* in L. and Fr. w. Shells, I. 87.

Helix Luquillensis, Shuttl. (*Polydontes*).

The lingual was received mounted from the late Mr. Robert Swift.

Lingual membrane (plate X., fig. 2–4) as usual in the *Helicidæ*. Centrals tricuspid, laterals bicuspid, cusps with long, sharp points, extending beyond the base of the plate. Marginals bicuspid, cusps short, bluntly rounded, the inner one, as usual, the longer.

We received no jaw of this species.

Helix notabilis, Shuttl. (*Thelidomus*).

Tortola. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, low, ends blunt; narrower at the centre; decided separate ribs, denticulating either margin.

Lingual membrane already published by us. (Am. Journ. Conch., VI. 177; see also plate IX., fig. 10). Centrals tricuspid, laterals bicuspid, the plates about as wide as high, the larger cusp with a long point extending beyond the lower margin of the

plate. Marginals quadrate, of equal width and height, with two short, wide, blunt, round cusps, the inner one slightly the larger.

Helix discolor, Fér. (*Thelidomus*).

Jaw arcuate, thick, ends blunt. Anterior surface with 7 unequal, decided, stout ribs, denticulating either margin.

Lingual membrane (plate X., fig. 1) long and narrow. Centrals with a long narrow plate expanded at the base, and bearing at its corners a small reinforcement; base of the plate extending beyond the cusp; bluntly tricuspid, the median cusp long, stout, with a short blunt point; side cusps subobsolete. Laterals as in the centrals, but unsymmetrical, and with a shorter plate. Marginals quadrate, wide as high, with two short, blunt denticles, the inner one slightly the longer.

Helix lima, Fér. (*Thelidomus*).

Porto Rico. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, thick, high, ends blunt; no median projection to the cutting edge. Anterior surface with 7 stout ribs. A strong, thick muscular attachment to the upper margin.

No lingual membrane received.

Helix marginella, Gmel. (*Caracolus*).

Porto Rico. Received mounted from the late Mr. Robert Swift.

A portion only of the jaw is preserved on the slide. It appears to be thick, arcuate, with strong transverse lines of reinforcement and decided ribs.

Lingual dentition as in *H. excellens* (see plate X., fig. 67).

Helix Chemnitziana, Pfr. (*Pleurodonta*).

Jamaica. Received mounted from the late Mr. Robert Swift.

Jaw stout, arched, ends attenuated, blunt; anterior surface with about 6 irregularly disposed ribs, stout and denticulating either margin.

No lingual membrane received.

Helix Carmelita, Fér. (*Pleurodonta*).

Jamaica. Received mounted from the late Mr. Robert Swift.

Jaw arcuate, ends blunt, anterior surface with about 6 stout ribs, denticulating either margin.

Lingual membrane (plate X., fig. 5) as usual in the *Helicidæ*. Central teeth short, bluntly pointed on the middle cusps, the side cusps subobsolete; laterals like centrals, also with obsolete

side cusps; marginals with oblique bluntly rounded broad cusps, the inner, larger, one bluntly bifid.

Helix punctata (*nux denticulata*), Born. (*Dentellaria*).

Martinique. Governor Rawson.

Jaw stout, arched, ends blunt, cutting edge with a blunt median projection, one stout, decided rib on the centre of the jaw, and three less developed separate ribs at each side of it.

Lingual membrane long and narrow (plate IX., fig. 8). Centrals high and narrow with long, stout median cusps, bearing a point extending nearly to the base of the plate; side cusps subobsolete. Laterals like the centrals, but unsymmetrical. Marginals low, wide, subquadrate, with one very long, broad, bluntly bifid, oblique denticle, and one smaller, bluntly rounded, side denticle.

Helix nucleola, Rang. (*Dentellaria*).

Martinique. Governor Rawson.

Jaw thick, arched, ends blunt; cutting margin with an obtuse median projection. One central, stout rib, denticulating either margin.

Lingual membrane, as usual in *Dentellaria* (see *H. punctata*, Born), above.

Helix formosa, Fér. (*Dentellaria*).

Antigua. Received mounted from the late Mr. Robert Swift.

Jaw arched; ends blunt; several strong, transverse lines of reinforcement, but no ribs; a median projection to cutting edge.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *punctata*, Born.)

Helix badia, Fér. (*Dentellaria*).

Received mounted from Mr. Swift.

Jaw stout, arched; ends blunt, with about eight decided ribs.

Lingual membrane as usual in the subgenus. (See pl. IX., fig. 8, of *H. punctata*, Born.)

Pupa rupicola, Say.

Ohio. A. G. Wetherby.

Jaw low, wide, slightly arcuate; ends but little attenuated, blunt; no median projection to cutting edge.

Lingual membrane as usual in the genus. (See figures of that of *corticaria*, *pentodon*, and *badia* in L. & Fr. w. N. A., I.) The cusps on the laterals, however, are very much stouter. There are five perfect laterals.

Strophia decumana, Fér.

Castle Island, Bahamas.

On pl. VIII., fig. 1, will be found figures of the dentition of this species. For full description, see Annals of Lyc. Nat. Hist. of N. Y., x., p. 348.

Bulimulus chrysalis, Pfr.

Martinique. Gov. Rawson.

Jaw of the type common in *Bulimulus*, *Cylindrella*, etc., arcuate, low; ends blunt; thin, transparent; with eighteen narrow, separated ribs; a transverse central line of reinforcement. Attached to the upper margin is a strong triangular membrane of the same consistency and material as the jaw itself, and equally resisting the action of potash, so as readily to be mistaken for the accessory plate of the *Succineæ*. (Pl. V., fig. 11.)

Lingual membrane (pl. V. fig. 12, 13) as usual in the *Helicinæ*. Centrals about as broad as long, tricuspid, the median cusp short and stout, its short point not extending to the base of the plate. Laterals like the centrals, but bicuspid. Marginals wide, low, with one inner, long, blunt, stout, oblique denticle, and one or two short, blunt side denticles.

Bulimulus Vincentimus, Pfr., var. ? (*Drymæus*).

Tobago. Jaw as usual in *Bulimulus*, *Cylindrella*, etc., thin, transparent, with numerous delicate, separated, narrow ribs.

Lingual membrane as in *Bulimulus taticinctus*, etc. (see Ann. N. Y. Lyc., x. pl. xi., fig. 1.)

Bulimulus Knorri, Pfr. (*Drymæus*).

Porto Cabello, Venezuela. Received mounted from the late Mr. Robert Swift.

Jaw arched, high, ends attenuated, blunt; an obtuse median projection to cutting edge; transverse lines of reinforcement, but no ribs.

An unusual form of jaw in this genus, though common in many subgenera of *Helix*.

Bulimulus Peruvianus, Brug. (*Plectostylus*).

Talcahuana. Museum Comparative Zoology.

Jaw as in *Cylindrella*, etc., with about thirty delicate ribs; upper central plate triangular.

Lingual membrane (pl. V., fig. 2) combining the usual characters of the genus with those peculiar to the group of *B. laticinctus*

(referred to above under *B. Vincentinus*). The central tooth is higher than wide, tricuspid, the central cusp short, not extending near the base of the tooth. The laterals (5 in number) are bicuspid, the inner cusp with short, subcircular cutting edge. Marginals of the type of *B. laticinctus* (l. c.).

Bulimus (*Pachyotus*) egregius, Jay.

Brazil. J. G. Anthony.

No jaw received.

Lingual membrane as usual in the *Helicidæ*. Centrals and laterals higher than wide, the plates almost extending to the point of the cusps; central with a large median and small side cusps; lateral bicuspid, the inner cusp very large, and bluntly pointed, the outer cusp very small, and acutely pointed. Marginals quadrate, about as high as wide, with one wide, very short, blunt inner cusp, and a similar small outer cusp. (Pl. VI., fig. 1.)

Succinea Barbadensis, Guild.

Barbados. Jaw and lingual membrane as usual in the genus.

Lithotis rupicola, Blanford.

Figs. 3–6 of plate V. represent the jaw and lingual dentition of this species, which are fully described in Ann. Lyc. Nat. Hist. N. Y., x. 346.

Erinna Newcombi, A. Adams.

Sandwich Islands.

Figs. 7–10 of plate V. represent the jaw and lingual dentition of this species, which have been fully described in Ann. of N. Y. Lyc. of Nat. Hist., x. p. 349.

Before closing this paper, I propose reviewing my work on lingual dentition and jaws, for the purpose of ascertaining what reliance may be placed on their characters as a basis for subgeneric distinction, in the genera *Helix* and *Bulimus*. Of *Bulimulus* we cannot yet speak with confidence, so poor is our material.

Sagda.—The genus is included in the *Vitrinea* of von Martens, but we have shown that it belongs to the *Helicea*, the marginal teeth being quadrate, not aculeate.

The jaw has no anterior ribs. In *H. Jayana* there is an approach to a median projection to the cutting edge, but not in *Haldemaniana* or *Foremaniana*.

The lingual membrane we have examined in *connectens*, *Jayana*,

and *Haldemaniana*. We figure that of the latter (plate IX., fig. 4), with which the others agree. The centrals have their plates short in comparison to the reflection, and broad. The middle cusp is long, with a long slender point. The side cusps are subobsolete, with short, acute, triangular points. The laterals are of same type as centrals, but bicuspid, the outer cusp more developed than the external cusps of the centrals. The marginals are wide, low, with one long, oblique, blunt, narrow inner cusp, and one or more side, small cusps. The dentition and jaw of this species are fully described in Am. Journ. Conch., VII. 175; *S. connectens* in Ibid. 175; *S. Jayana* in Ann. N. Y. Lyc., x. 219.

Leucochroa.—We have shown *L. Boissieri*, Charp., to belong to *Helicea* and not to *Vitrinea*, and expressed our belief that the same will prove true of *candidissima*. (See Ann. N. Y. Lyc., x. 220.) We now figure the dentition (plate IX., fig. 3). The jaw is ribless, with a median projection.

Microphysa is put in *Helicea* by von Martens. *H. minuscula* (see L. and Fr. w. Shells) and *circumfirmata*, Redf. (N. Y. Ann., x. 231), both belong to *Vitrinea*, having aculeate marginal teeth, and jaw of *Zonites*. *H. turbiniformis*, Pfr. (Ann. N. Y. Lyc., x. 79, pl. ii. fig. 2) has a jaw as in *Cylindrella*, *Bulimulus*, etc.—*i. e.* with numerous very delicate, distant ribs, giving the appearance of separate plates. It would be put in *Goniognatha* of Morch, though there are no upper triangular median plates. We here figure the lingual dentition (plate IX., fig. 7).

For *Patula*, *Gonostoma*, *Polygyra*, *Polygyrella*, *Stenotrema*, *Triodopsis*, *Mesodon*, *Acanthinula*, *Vallonia*, *Aglaja*, *Arionta*, *Euparypha*, *Tachea*, *Pomatia*, *Glyptostoma*, see L. and Fr. w. Shells N. A., I., and our various papers on dentition.

Dorcasia is known to us only by one species, *H. similaris*, Fér. (see Am. Journ. Conch., VII. 176). The jaw has eight decided ribs. I figure the lingual dentition (plate IX., fig. 6).

Fruticicola is known to us only by *H. griseola*, Pfr. (see Proc. Phila. Ac. N. S. 1873, 243). The dentition I now figure (plate X., fig. 11).

Coryda.—We have described the lingual membrane only of this subgenus, and that in only one species, *H. Gossei*, Pfr. (Am. Journ. Conch., VII. 177). We figure it on plate IX., fig. 2. The centrals have long, narrow plates, a very short reflection, with a short, blunt median cusp and obsolete side cusps. Laterals like

centrals, but unsymmetrical. Marginals quadrate, with one broad, oblique, long, bluntly bifid inner cusp, and one or two very short rounded side cusps.

Thelidomus.—We have examined *H. aspera*, Fér. (Am. Journ. Conch., VI. 204); *discolor*, Fér. (ante, p. 51); *notabilis*, Shuttl. (Amer. Journ. Conch., VII. 177); *lima*, Fér. (ante, p. 51); and *provisoria*, Pfr. (Ann. Lyc. N. Y., x. 347).

There are 8 decided stout ribs on the jaw of *aspera*, 7 on that of *discolor* and *lima*, on *provisoria* we find 10–15 ribs, less decided than in the other two species.

I figure the lingual dentition of *H. discolor* (plate X., fig. 1). *H. aspera* agrees with it. The marginal teeth of *provisoria* and *notabilis* agree with those of *aspera* and *discolor*, but as the centrals and laterals differ in the shape of the plates and the development of the cusps, I also figure the central and lateral of *notabilis* (plate IX., fig. 10), with which *provisoria* agrees.

Cysticopsis we know by *tumida*, Pfr., and *pemphigodes*, Pfr. For description and figure of the former see Ann. N. Y. Lyc. N. H., IX. 213, f. 3; Am. Journ. Conch., VI. 203, f. 1. Finding the dentition of *pemphigodes* to be different (Am. Journ. Conch., VII. 177) I here figure it (plate IX., fig. 1).

Plagioptycha.—We have published *H. loxodon*, Pfr., *Albersiana*, Pfr., *monodonta*, Lea, *diaphana*, Lea, and *macroglossa*. (See Am. Journ. Conch., VII. 177, 178.) They all agree in having a ribless jaw with blunt median projection to cutting edge, and in dentition such as I figure for *H. macroglossa*, Pfr. (plate X., fig. 10).

Polymita.—We have elsewhere (Ann. N. Y. Lyc., x. 341) pointed out the necessity of revising this subgenus. The typical species *muscarum*, and *H. picta* which must be removed to it from *Liochila*, have a ribless jaw without median projection to the cutting margin (see Am. Journ. Conch., VI. 204, pl. IX., f. 4, 10). The lingual dentition of both species agrees (see ibid. and Ann. N. Y. Lyc., x. pl. xvi. fig. 14). It is entirely different from that of any species now known.

Hemitrochus must be used as the name for the balance of the subgenus *Polymita* of von Martens. We have examined *varians*, Mke. (Amer. Journ. Conch., VII. 206, and L. and Fr. w. Shells, I. 185); *Troscheli*, Pfr. (Ann. N. Y. Lyc., x. 343); *graminicola*, Ad. (Am. Journ. Conch., VII. 178); *gallopavonis*, Val. 343. (N. Y. Am. X. 343.) All agree in having an arched ribless jaw with blunt

median projection. All have lingual dentition such as I figure of *graminicola* (plate X., fig. 8).

Liochila.—As stated already (p. 56) *H. picta*, Born, must be removed from this subgenus to *Polymita*, probably also *H. sulphurosa*, Mor.

Eurycratera has decided stout ribs on its jaw. We have seen *H. crispata*, Fér. (Am. Journ. Conch., VII. 179), and *H. angulata*, Fér. (this paper, p. 50). The lingual dentition is essentially the same in each, but on account of difference in the development of the points of the side cusp, I figure that of each (pl. IX. fig. 5; pl. X. fig. 9).

Polydontes has the same type of dentition, as in the last subgenus, as shown in my figure of *H. Luquillensis*, Shuttl. (plate X., fig. 2–4) the only species examined by us. Jaw not seen.

Stylodon.—We have shown *H. militaris*, Pfr. to be a *Nanina* (Ann. N. Y. Lyc., x. 169). Other species unexamined by us.

Erepta.—The same may be said of *H. stylodon*, Pfr. (see ante, p. 48), and *leucostyla*, Pfr., and *rufizonata*, H. Ad. (Ann. N. Y. Lyc., x. 169), all Mauritius species.

Dentellaria.—We have examined a large proportion of the known species. The jaw varies somewhat, so that each description should be studied. There seems a tendency to a median projection to the cutting edge, and to the presence of ribs. *H. pachygastra*, Gray (Ann. N. Y. Lyc., x. 305) has 7 decided ribs and no median projection. *H. orbiculata*, Fér. (Am. Journ. Conch., VI. 205, pl. ix. f. 14) has traces of ribs and no median projection. *H. Isabella*, Fér. (l. c. VII. 179) has decided ribs and no median projection. *H. dentiens*, Fér. (Am. Journ. Conch., VII. 179) has decided ribs and no median projection. *H. nucleola*, Rang (ante, p. 52) has one decided rib and a median projection. *H. badia* (ante, p. 52) has 8 decided ribs. *H. formosa*, Fér. (ante, p. 52) has no ribs, but a strong median projection. *H. perplexa*, Fér. (Ann. N. Y. Lyc., x. 221) has obsolete ribs and median projection. *H. lychnuchus*, same as last (Ann. N. Y. Lyc., x. 221, pl. xiv. f. 5, 7). *H. punctata*, Born (ante, p. 52) has median projection and decided ribs. *H. Josephinæ*, Fér. (Ann. N. Y. Lyc., x. 306) is strongly arched, has no ribs, but a median projection.

All the above species agree in their dentition. See figure of that of *lychnuchus* (l. c.) and of *punctata* (plate IX., fig. 8 of this paper.)

Pleurodonta.—The jaw in *Chemnitziana*, Pfr. (ante, p. 51) has 7 stout, separated ribs; *Carmelita*, Fér. has 6 (ante, p. 51); *acuta*, Lam. (Amer. Journ. Conch., VI. 204) has 7 ribs.

The lingual membrane is the same as I figure for *Carmelita* (plate X., fig. 5) in *Schroteriana* (Amer. Journ. Conch., VII. 179), in *invalida*, Ad. (Ann. N. Y. Lyc., x. 179). In *acuta*, Lam. the centrals and laterals are of the same type, but the marginals have only one long, wide, blunt denticle, slightly bifid at end. In this respect it is more like *Caracolus* than the other species of *Pleurodonta* examined by us.

Caracolus.—We have shown *H. Bermudensis*, Pfr. (Ann. N. Y. Lyc., x. 221) to belong to *Vitrininæ; H. inversicolor* (l. c. x. 169) to *Nanina.*

The jaw in *H. marginella*, Gmel. (ante, p. 51) appears to be ribbed.

I figure (plate X., fig. 6-7) the lingual dentition of *H. excellens*, Pfr. (Am. Journ. Conch. VII. 180). *H. marginella*, Gmel. agrees with it, excepting that the cusps of the marginals are shorter.

Leptoloma.—We have described only *H. fuscocincta*, Ad. (Am. Journ. Conch., VII. 180). The jaw has a median projection, but no ribs. The lingual I figure on plate IX., fig. 9.

Acavus.—*H. phœnix*, Pfr. has a ribless jaw (Am. Journ. Conch., VII. 180). Its dentition is figured on plate IX., fig. 11.

In *Bulimus* we have examined the following genera:—

Macrodontes we know by *B. odontostomos* (Am. Journ. Conch., VI. 209). The jaw is ribless. The dentition is figured on plate VI., fig. 7.

Pelecychilus we know from *B. aurissileni*, Born (Ann. Lyc. N. H. N. Y., x. 229), and *B. glaber*, Gmel. (not before published); both have delicate ribs as in *Bulimulus*, *Cylindrella*, etc. The dentition of the former is given on plate VI., fig. 4; of the latter on plate VI., fig. 6.

Anthinus we know from *B. multicolor*, Rang (Am. Journ. Conch., VI. 208). The jaw is ribless. Lingual dentition given on plate VI., fig. 8.

Pachyotus we know from *B. egregius*, Jay (see this paper, p. 54). Jaw not examined. Lingual dentition figured on plate VI., fig. 1.

Borus.—We have examined *B. oblongus*, Mull. Its ribbed jaw and lingual dentition are figured by Heynemann (Mal. Blatt., xv.).

Of *Orphnus* we have examined one species, *B. Hanleyi*, Pfr. (Am. Journ. Conch., VI. 208). The jaw is ribless, with a median projection. The lingual dentition is given on plate VI., fig. 5.

Dryptus we have examined in two species, *B. pardalis*, Fér. (Am. Journ. Conch., VII. 181) and *B. marmoratus*, Dunk. (l. c.). The jaw of the latter is unknown. In the former it is ribbed. The lingual dentition of *B. marmoratus* is given on plate VI., fig. 2. In *B. pardalis* it has not been examined.

Eurytus we know from only one species, *B. aulacostylus*, Pfr. (Ann. Lyc. N. H. N. Y., x. 282). The jaw has delicate ribs as in *Bulimulus*, *Cylindrella*, etc. The lingual dentition is given on plate VI., fig. 3.

A comparison of the figures I have given of the lingual dentition of the subgenera of *Bulimus* shows a greater constancy in that genus than in *Helix*, especially as regards the marginal teeth.

I add a figure of the dentition of *Cochlostyla fulgetrum*, Brod. (plate V., figs. 14–16). See Am. Journ. Conch., VII. 180.

EXPLANATION OF THE PLATES.

PLATE II.

A. ARIOLIMAX NIGER, *J. G. Cooper*. The tail enlarged to show the caudal mucus pore. From the type in the California State Collection, preserved in spirit.

B. ARIOLIMAX COLUMBIANUS? The tail, slightly enlarged, of a specimen from Mr. Hemphill (see p. 35) showing the mucus pore. It must be borne in mind that the specimen has long been preserved in spirit.

C. ARIOLIMAX COLUMBIANUS? A specimen from San Mateo Co., California, received from Mr. Henry Hemphill (see p. 38). The genitalia about life size.

1. The testicle.
2. The epididymis.
3. The accessory gland of the last?
4. The prostate gland.
5. The sac of the penis.
6. The retractor muscle of the penis.
7. The vas deferens.
8. The oviduct.

9. The genital bladder.
10. The external orifice of the genitalia.
11. The ovary.
16. The duct of the genital bladder.

D. A portion of the digestive organs of the same.
1. The buccal mass.
2. The œsophagus.
3, 3. The ducts of the salivary glands.
4, 4. The salivary glands.
5. The pouch of the lingual membrane.

E. The same; an extreme marginal tooth of the lingual membrane.

F. Same as last—life size.
1–4. See fig. D.
5. The stomach.
6. The blind sac of the same.
7, 7. The biliary ducts.
8. The intestine.
9. The rectum.

G. The same. The rudimentary internal shell.

H. The same. The jaw.

PLATE III.

Fig. I. ZONITES LÆVIGATUS, Raf. The genital system. Same references as in pl. II. fig. C.
13. Dart sac? See p. 39.

Fig. II. Helix reticulata, Pfr. = RAMENTOSA, Gld. Genital system. Same references as in fig. 1.
13. Vaginal prostate.
13*a*, *a*. Flagella of same.
15. Flagellum of penis.
16*a*. Accessory to duct of genital bladder.

Fig. III. HELIX MITCHELLIANA, Lea. Genital system. Same references as in fig. I.

Fig. IV. HELIX KELLETTI, Forbes. Genital system. Same references as in fig. II.
14. Dart sac? See page 40.

Fig. V. HEMPHILLIA GLANDULOSA. Genital system. Same references as in fig. I.

Fig. VI. The same. See page 39 for 5*a* and 5*b*.

PLATE IV.

Fig. I. Genitalia of MACROCYCLIS VANCOUVERENSIS, Lea.

1. Testicle.
2. Epididymis.
3. Accessory gland.
4. Prostate.
5. Sac of penis.
7. Vas deferens.
8. Oviduct.
9. Genital bladder.
10. External orifice.
11. Ovary.
14. Dart sac? vaginal prostate?
16. Duct of genital bladder.

Fig. II. Genitalia of PATULA STRIGOSA, Gld. Same references as in fig. I.

Fig. III. Genitalia of HELIX NICKLINIANA, Lea. Same references as in fig. I.

6. Retractor muscle of penis.
13. Vaginal prostate.
13*a*. Flagellum to last.
15. Flagellum to penis.
16*a*. Accessory duct to the genital bladder.

Fig. IV. Genitalia of HELIX APPRESSA, Say. Same references as in fig. I.

Fig. V. Genitalia of H. ROEMERI, Pfr. Same references as in fig. I.

PLATE V.

Fig. 1. Lingual dentition of HELIX TEXASIANA, Mor. Central, lateral, and marginal teeth.

Fig. 2. Same of BULIMULUS PERUVIANUS, Brug.

Fig. 3. LITHOTIS RUPICOLA, Bl. Jaw.

Fig. 4. Same; central and lateral teeth.

Fig. 5. Same; marginal teeth.

Fig. 6. Same; extreme marginal teeth.

Fig. 7. ERINNA NEWCOMBI, A. Ad. Jaw.

Fig. 8. Same; central and lateral teeth.

Fig. 9. Same; marginal teeth.

Fig. 10. Same; extreme marginal teeth.

Fig. 11. BULIMULUS CHRYSALIS, Pfr. Jaw.
Fig. 12. Same; central and lateral teeth.
Fig. 13. Same; marginal teeth.
Fig. 14. COCHLOSTYLA FULGETRUM, Brod. (*Canistrum*); central and lateral teeth.
Fig. 15. Same; first marginal teeth.
Fig. 16. Same; extreme marginal teeth.
Fig. 17. HELIX WETHERBYI, Bland; central and lateral teeth.
Fig. 18. Same; marginal teeth.

PLATE VI.

Central, lateral, and marginal teeth of—
Fig. 1. BULIMUS EGREGIUS, Jay (*Pachyotus*).
Fig. 2. MARMORATUS, Dunk. (*Dryptus*).
Fig. 3. AULACOSTYLUS, Pfr. (*Eurytus*).
Fig. 4. AURIS-SILENI, Born (*Pelecychilus*).
Fig. 5. HANLEYANUS, Pfr. (*Orphnus*).
Fig. 6. GLABER, Gmel. (*Pelecychilus*).
Fig. 7. ODONTOSTOMUS, Sowb. (*Macrodontes*).
Fig. 8. MULTICOLOR, Rang. (*Anthinus*).

PLATE VII.

Fig. A. AMPHIBULIMA PATULA, Brug. Dominica.
Fig. B. Same, to show variations in cusps of laterals.
Fig. C. AMPHIBULIMA PATULA. St. Kitts, see p. 44.

PLATE VIII.

Fig. 1. STROPHIA DECUMANA, *a*. Central and lateral teeth; *b*. marginal teeth.
Fig. 2. AMPHIBULIMA RUBESCENS, Desh. Jaw.
Fig. 3. Same. Lingual membrane. *a*. Central and lateral teeth; *b*. marginal teeth; *c*. extreme marginal teeth.
Fig. 4. Same. Genitalia.
Fig. 5. AMPHIBULIMA APPENDICULATA, Pfr. Genitalia.
Fig. 6. Same. Lingual membrane. *a*. Central and lateral teeth; *b*. marginal teeth.
Fig. 7. GONOSPIRA NEWTONI, H. Ad. Genitalia.

PLATE IX.

Lingual dentition; central, lateral, and marginal teeth of—
Fig. 1. HELIX PEMPHIGODES, Pfr., *Cysticopsis*.

Fig. 2. HELIX GOSSEI, Pfr., *Coryda.*
Fig. 3. HELIX BOISSIERI, Charp., *Leucochroa.*
Fig. 4. HELIX HALDEMANIANA, Ad., *Sagda.*
Fig. 5. HELIX ANGULATA, Fér., *Eurycratera.*
Fig. 6. HELIX SIMILARIS, Fér., *Dorcasia.*
Fig. 7. HELIX TURBINIFORNIS, Pfr., *Microphysa.*
Fig. 8. HELIX PUNCTATA, Born, *Dentellaria.*
Fig. 9. HELIX FUSCOCINCTA, Ad., *Leptoloma.*
Fig. 10. HELIX NOTABILIS, Fér., *Thelidomus.*
Fig. 11. HELIX PHŒNIX, Pfr., *Acavus.*

PLATE X.

Central, lateral, and marginal teeth of lingual membrane of—
Fig. 1. HELIX DISCOLOR, Fér., *Thelidomus.*
Fig. 2, 3, 4. HELIX LUGUILLENSIS, Shuttl., *Polydontes.*
Fig. 5. HELIX CARMELITA, Fér., *Pleurodonta.*
Fig. 6, 7. HELIX EXCELLENS, Pfr., *Caracolus.*
Fig. 8. HELIX GRAMINICOLA, Ad., *Polymita.*
Fig. 9. HELIX CRISPATA, Fér., *Eurycratera.*
Fig. 10. HELIX MACROGLOSSA, Pfr., *Plagioptycha.*
Fig. 11. HELIX GRISEOLA, Pfr., *Fruticicola.*

PLATE XI.

A. ARIOLIMAX NIGER, J. G. Coop. From the type in the California State collection. Extreme marginal teeth from the lingual membrane.
B. Same as last. The central tooth and first lateral teeth.
C. Same as last. The genitalia enlarged. References same as in fig. C. of plate II.
13. The vaginal prostate.
D. ARIOLIMAX CALIFORNICUS? From a specimen from San Mateo, Cal., in the Museum of Comparative Zoology. The genitalia slightly enlarged. Same references as in last figure, excepting 15, the flagellum.
E. Same as last. The digestive organs, life size. Same references as in fig. F. of plate II.
F. The same. 1. Central tooth; 2. first lateral tooth of the lingual membrane.
G. The same. Extreme marginal tooth of the lingual membrane.

DESCRIPTION OF SOME SPECIES OF REPTILES OBTAINED BY DR. JOHN F. BRANSFORD, ASSISTANT SURGEON UNITED STATES NAVY, WHILE ATTACHED TO THE NICARAGUAN SURVEYING EXPEDITION IN 1873.

BY EDWARD D. COPE, A.M.

The collection, though not large, embraces a number of interesting new and rare species besides those usually obtained in the region of Nicaragua. The whole number is twenty-eight, distributed as follows: serpents 12, lizards 9, tortoise 1, and Batrachia 6. Several interesting points in geographical distribution are established. I have added descriptions of three new snakes, one from near the same, and two from more southern localities.

OPHIDIA.

Pliocercus dimidiatus, Cope.
Ophibolus micropholis, Cope.
Spilotes pullatus, L. var.

Of the typical form; scales in fifteen or sixteen rows, the outer smaller, several median considerably enlarged, the more central only faintly keeled; generally biporous. Only seven superior labials, the eye over the fourth and chiefly the fifth; sixth and seventh much enlarged, and nearly reaching the parietal shield, being only separated by a single narrow temporal each. Orbitals 1–2, the anterior nearly reaching the frontal. Loreal small, longer than high; nasals two, quite elongate. Frontal longer than wide, with broad front and concave sides. Parietals wide, truncate, followed by four scuta, the two outer the larger. Temporals 1–1 or 1–1–1. Inferior labials eight or nine, separated from the anterior gastrosteges by two rows of elongate scales on each side, in continuation of the geneials.

The general form is elongate; head a long oval; muzzle not prominent. Gastrosteges 226; an entire anal; mosteges 118.

General color black; near the middle of the length yellow spots appear at intervals on the belly, and increase in extent and frequency until they occupy most of the space anteriorly. On the upper surface a few yellow spots appear at remote intervals on the anterior half. A yellow band extends across the occiput from angle to angle of the mouth, and one across behind the or-

and sixth elongate. Inferior labials ten, mostly transverse; four pairs of geneials, all except the first broader than long. Tail short, m. .047 in length, from a total of m. .243.

Color pale, with black transverse spots, which are wide anteriorly (the second covers seven transverse rows of scales) and become gradually narrower, having a width of only two cross-rows on the hinder part of the body. Posteriorly their lateral ends are broken off, and alternate with the dorsal portion. A few small blotches on the ends of the gastrosteges.

This serpent and two fishes were presented to the Academy of Natural Sciences with the statement that they were derived from some portion of the Peruvian Andes, from an elevation of twelve thousand feet. One of the fishes is *Trichomycterus dispar*, C. V., and the other is described below as *Protistius semotilus*.[1]

[1] PROTISTIUS SEMOTILUS, gen. et sp. nov.

Family ? Mugilidæ.

First dorsal fin represented by a single rudimental spine; second originating a little behind the line of the first anal radii. Ventrals present; lateral line rudimental. Mouth bordered above by the premaxillary only, which supports a band of rather large bristle-like teeth, those of the outer series the largest. Dentary bones with strong symphysis, with a band of teeth like those of the premaxillary. Swim-bladder present; alimentary canal short, simple.

Char. Specif.—Snout conical both from the lateral and vertical views. Premaxillary bone viewed from above, wide and angular crescentic; top of head moderately convex in cross section, its integument not separated by a fold from the premaxillary. Lower jaw horizontal and angulated at the rictus, and symphysis, as in the genus *Mugil*. Pectoral fin elevated, rather short, the ventral commencing below its apex. Fin radii D. I. I. 10; P. 15; V. 5; A. I. 13; C. forked 2+8—9+2. Scales 4—81—17; lateral line very imperfect; isolated tubes visible at various points between scapula and tail. Head a little more than four times in length minus caudal fin; depth of body 5.5 times in the same; caudal peduncle deep. Eye with round adipose margins, 4.75 times in length of head, and twice in interorbital width. Top of head, opercula, and cheeks entirely scaled, the latter in four rows.

Above olivaceous, below yellow, a broad lead-colored lateral band on the posterior .66 of the length.

Length to opercular border m. .027, to ventral fins .052, to first dorsal .066, to second dorsal .078 to end of caudal fin .140, all axially measured.

There are three gills and a half, and no pseudobranchus; the first branchial arch is the only one furnished with rakers. Branchiostegal radii six.

In its physiognomy this fish is intermediate between that of the *Mugilidæ*

Leptognathus nebulatus, L.
Elaps nigrocinctus, Gird.
Bothrops atrox, L.
Teleuraspis schlegelii, Berth.

Yellow variety with short superciliary horns.

LACERTILIA.

Anolis bransfordii, sp. nov.

Abdominal scales smooth, pavement-like, longer than the dorsal and lateral scales, which are small, subequal, and smooth. Scales of tail subequal, carinate. Muzzle medium, shorter (from eye) than wide at orbits. Auricular meatus large, fully half of eye. Facial rugæ obsolete, bounding a distinct cavity, which is covered by smooth scales of the size of those on the remaining portions of the muzzle, in six longitudinal series. Superciliaries wide, separated from each other by one, and from the large occipital by two rows of scales. Twelve supraorbital scuta keeled; six loreal rows; fan little developed. Infralabials equal, small. Limbs slender, the anterior extending to the groin, the posterior to the end of the muzzle; dilatations well developed. Brachial and femoral scales equal ventral. Tail long and slender.

Color above golden-lead color, beneath silvery, the line of separation defined from the orbit to the groin. No cross bands on head or body; front brown speckled; feet blackish.

and that of *Cyprinodontidæ*. The form and scaling of the head and mouth, with the small spinous dorsal, are very similar to those of the *Mugils*, while the posterior position of the ventral fins and supporting bones, with the simple stomach and intestine, are characters of the latter family. I was unable to find any *ductus pneumaticus*, and if it exist it must be very slender.

The weight of evidence is in favor of referring this genus to the *Cyprinodontidæ*, and should its only dorsal spine occasionally be wanting, the reference will be less inappropriate than might at first appear.

The rudimental dorsal consists of a short (.002 m.) spine, but little elevated above the dorsal line on account of the small extent of the membrane which binds it. It is well separated from the second dorsal.

This fish must be regarded as an interesting annectant form between types usually placed in the distinct divisions of *Physostomi* and *Physoclysti*.

				M.
Length from end muzzle to eye			. . . . .	.0057
"	"	"	ear	.0105
"	"	"	axilla	.0170
"	"	"	groin	.0350
"	"	"	end of tail	.1190

This species resembles both the *A. longicaudus*, Hallow., and *A. trochilus*, Cope.[1] From the former it differs in the smooth abdominal scales, large auricular meatus, etc.; resembling more the latter. In *A. trochilus*, a fine specimen of which accompanies the collection, the scales of the frontal area are much smaller, forming nine rows; four rows separate the superciliaries from each other and from the occipital. The muzzle is longer, and the head is marked with brown chevrons and cross-bands.

Dedicated to Dr. Bransford, who has been successful in his zoological investigations in connection with the expedition.

Anolis trochilus, Cope.

A female, with a single large egg in each oviduct.

Anolis cupreus, Hallow.
Anolis biporcatus, Wiegm.

The most southern locality recorded for this species.

Anolis pentaprion, Cope.

The most northern locality yet discovered for this *Anolis*.

Chamæleopsis hernandezii, Weig.
Stenodactylus fuscus, Hall.
Sphærodactylus glaucus, Cope.
Amiva eutropia, Cope.

TESTUDINATA.

Kinosternum leucostomum, Dum.

BATRACHIA.

Bufo sternosignatus, Gthr.
Bufo, sp.
Dendrobates auratus, Girard.
Dendrobates ignitus, sp. nov.

First finger shorter than second; end of the tarsus of the extended foot reaching the end of the muzzle. Membranum tympani visible, one-fifth the eye slit in extent; muzzle little prominent, as long as eye measured on the side. Derm of the back

[1] Proceed. Acad. Sci. Phila., 1871, 215.

rather thick and glandular in fresh specimens; of the belly and limbs smooth. Color, vermilion red, all four limbs black, in four specimens. In a fifth which represents a variety, the red is replaced on the upper surfaces of the body and femur by a pink, which is thickly black speckled; the faces of all the limbs, which are concealed when the latter are drawn up, are vermilion. Size small.

	M.
Length from end muzzle to axilla	0.0095
" " " " " vent	.0115
" of fore limb	.0138
" of hind limb	.0253
" of hind foot	.0120
Width at tympana	.0060
" of sacrum	.0040

Hyla ebraccata, sp. nov.

Of the type of *H. leucophyllata*, and perhaps to be regarded as a color variety of it. It is a very distinct one and probably geographically circumscribed, and hence until intermediate forms are discovered, may be considered as a species. Head broad, short, lores nearly vertical. Tympanum one-fifth orbit; skin above perfectly smooth. Fingers palmate to end of first phalange, toes to end of second. Tongue little free behind; vomerine teeth in fasciculi opposite anterior margin of nares. The heel extends to beyond the muzzle, which marks the middle of the forearm. Color above very light golden-brown; a deep brown triangular spot between the eyes, whose apex is produced backwards to a similar large spot on the back. A purplish-brown band from the end of the muzzle to the end of the coccyx, which fades below into the white of the belly. Edges of the upper lip white marked; a large yellow spot below the eye, and small yellow spots in the lateral band. On the foreleg, the humerus like the forearm is brown above, silver spotted. On the hind leg, the femur is entirely colorless; tibia is brown with silver bands and spots; bases of all the toes colored. Fingers uncolored except on the metacarpus. Belly yellow. Length of head and body 29 mm., width head 11 mm. Length hind leg 51 mm., to hind foot 22 mm.

Hypsiboas xerophyllum, Dum. Bibr.

Differing slightly from the typical form Surinam; probably a geographical variety.

	M
Length of head and body	.064
" of head	.006
Width of head	.004
Length of tail (extremity lost)	.058
" of fore limb	.0027

Color, a dark reddish-brown; a dorsolateral series of pale spots one each side, separated by an average width of eight scales.

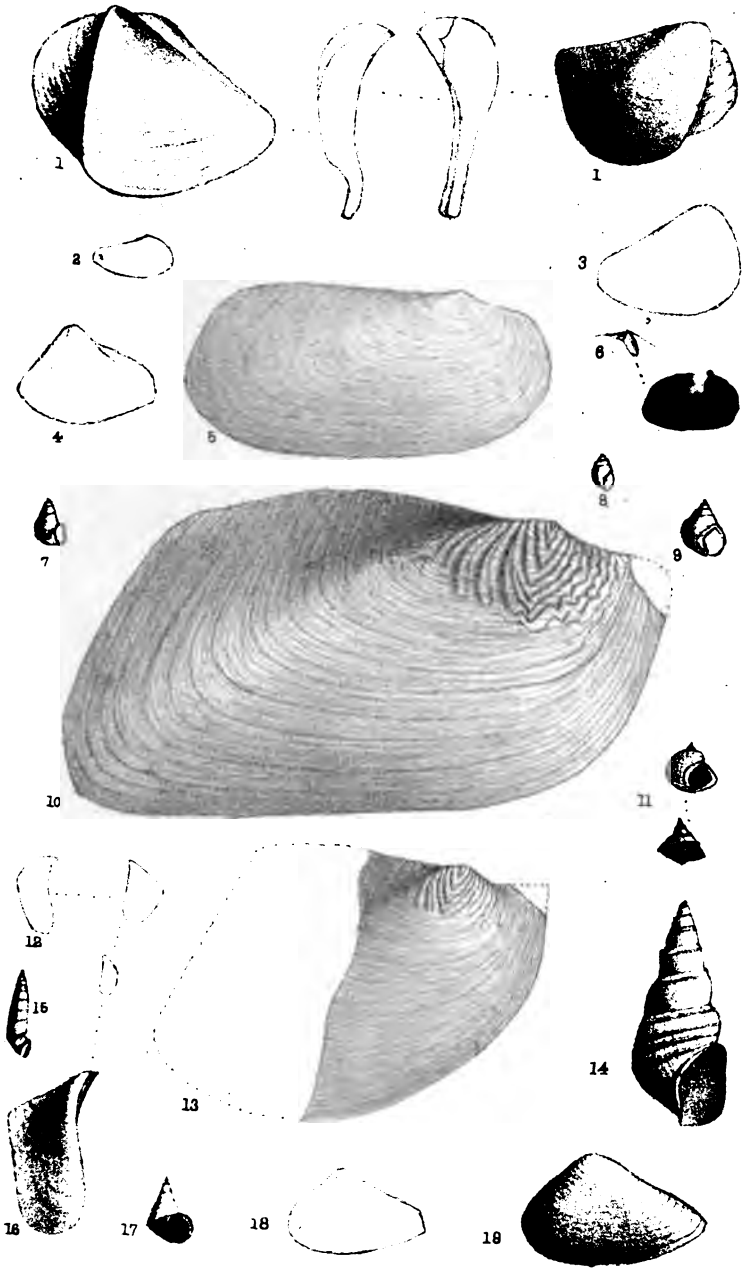
From Nauta on the Peruvian Amazon; obtained by Professor Orton. Various peculiarities distinguish this little saurian from the *Ophiognomon trisanale*, among which are the more numerous scales, and mutual contact of the second pair of infralabials.

Gerrhosteus prosopis, gen. et sp. nov.

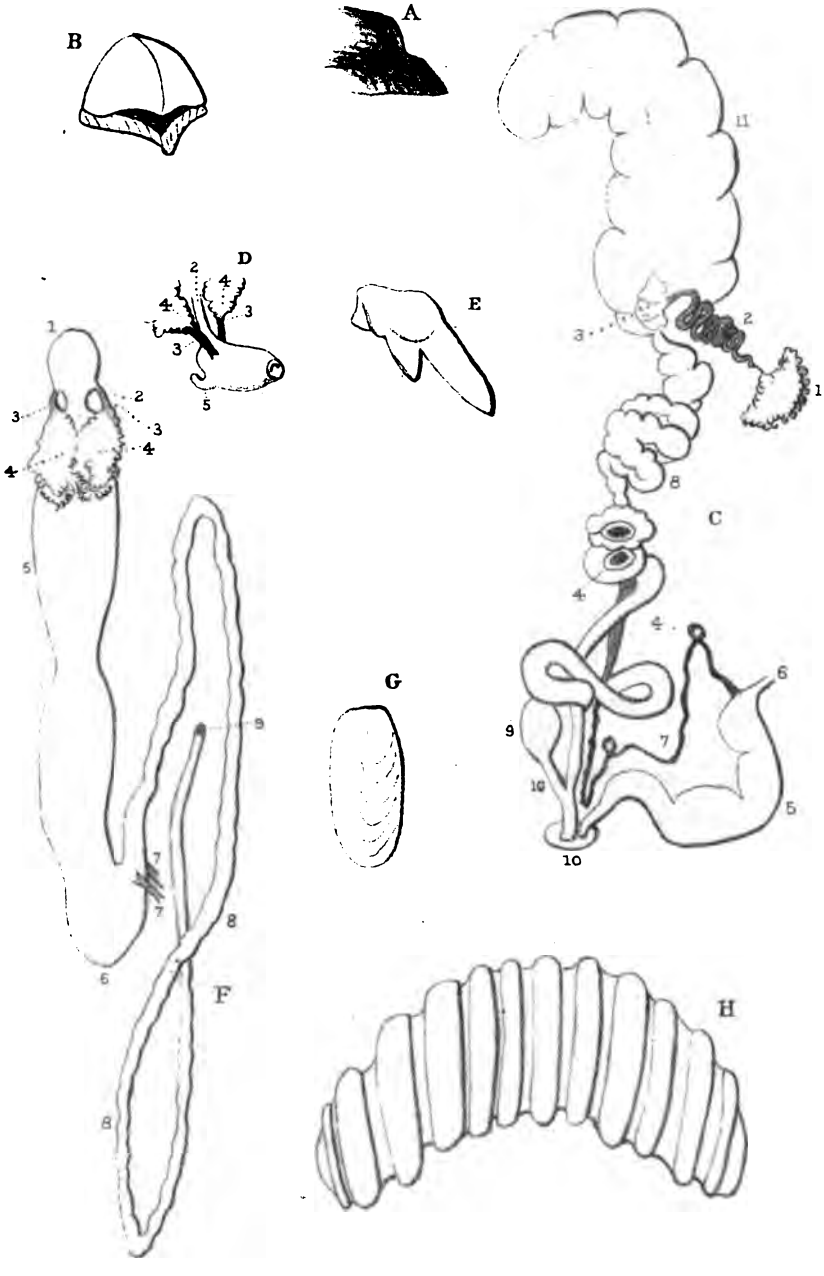
Dentition opisthoglyph; cranial scuta normal except that the prefrontals are united into a continuous shield. A loreal and a preocular; pupil vertical. Anal scutum undivided; subcaudals two rowed. Scales poreless, smooth, subequal. The neural spines of the vertebræ each supporting a shield-like expansion, giving a T-shaped cross section, which is divided by a median groove.

This genus is the first of the *Ophidia* known to possess the osseous expansions common to some genera of Batrachia, etc., of the western tropical part of the Neotropical region, and the miocene salamanders of the genus *Chelotriton*, Pom. The great development of the neural spine is not unlike that seen in frogs of the genus *Dendrobates*, which are characteristic of this region. The series of closely consecutive bony parallelograms, forms an elevated rib throughout the length of the animal, which is clearly visible through the skin, which is not involved in it, though thin and closely adherent. The structure would appear to be an additional protection to the spinal cord from blows or falling objects.

Char. Specif.—General appearance that of a Lycodont, while the dental and scutal characters ally it most to *Oyrrhopus*. Head an elongate oval, very distinct from the narrow neck; body moderately stout; tail short, terminating in a corneous spine. Rostal plate small, not prominent, internasals small. Frontal broad as long, straight in front with two subequal lateral facets for the preocular and the short superciliary. Parietals elongate. Nasal apparently single, large, descending nearly to the edge of the lips. Dorsal small, not longer than high. Preocular large,



Conrad on new Fossils of the Pebas Group



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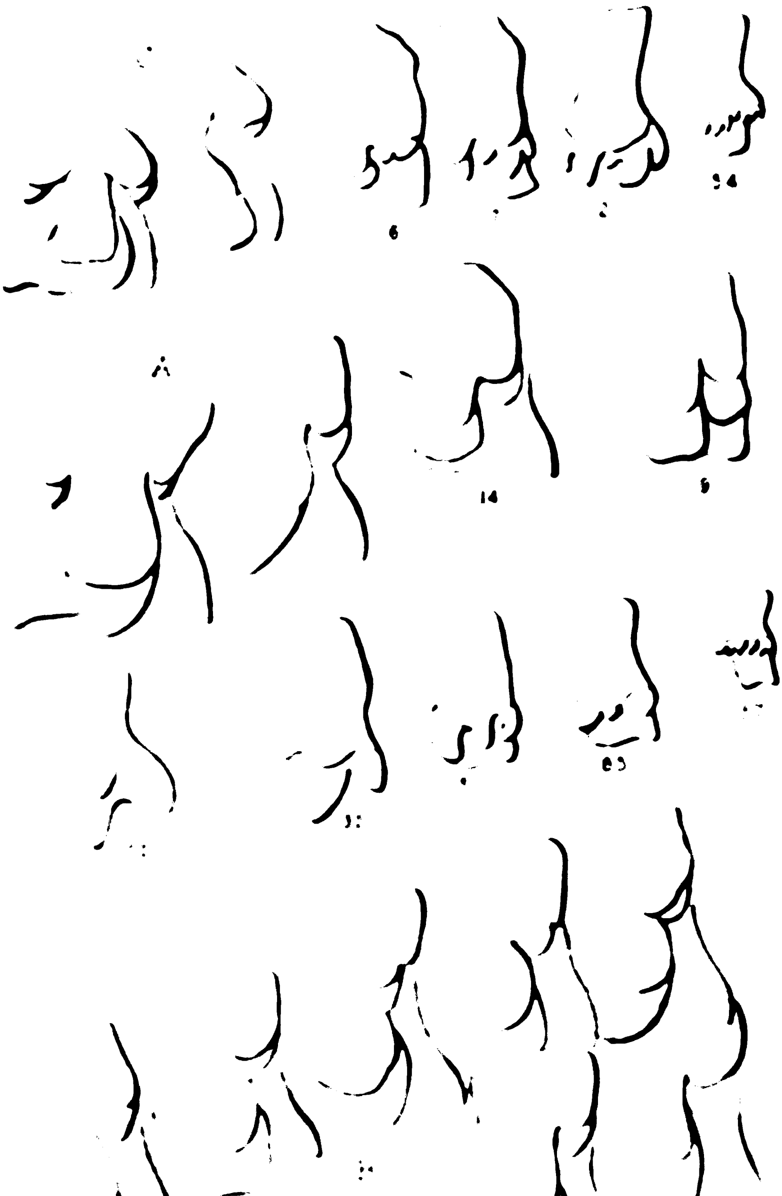

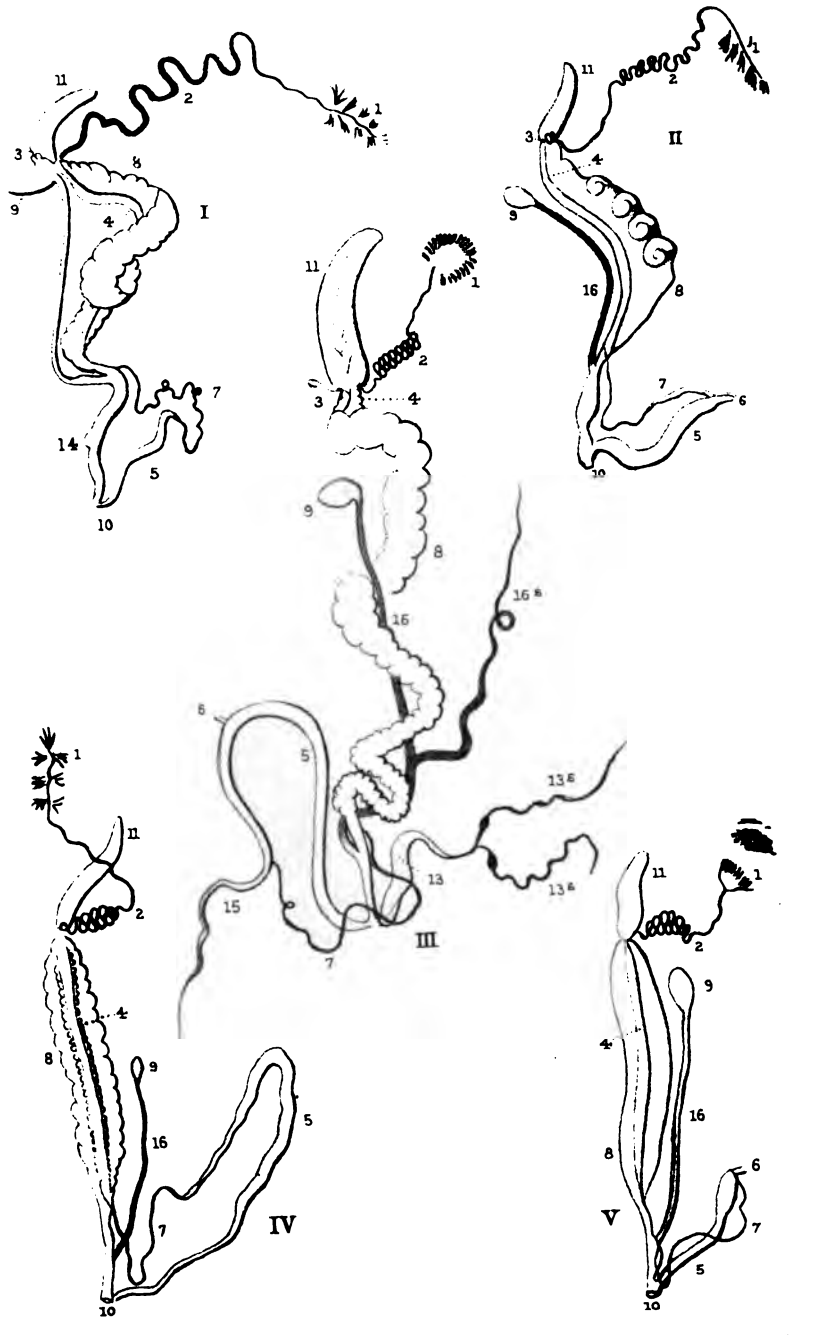

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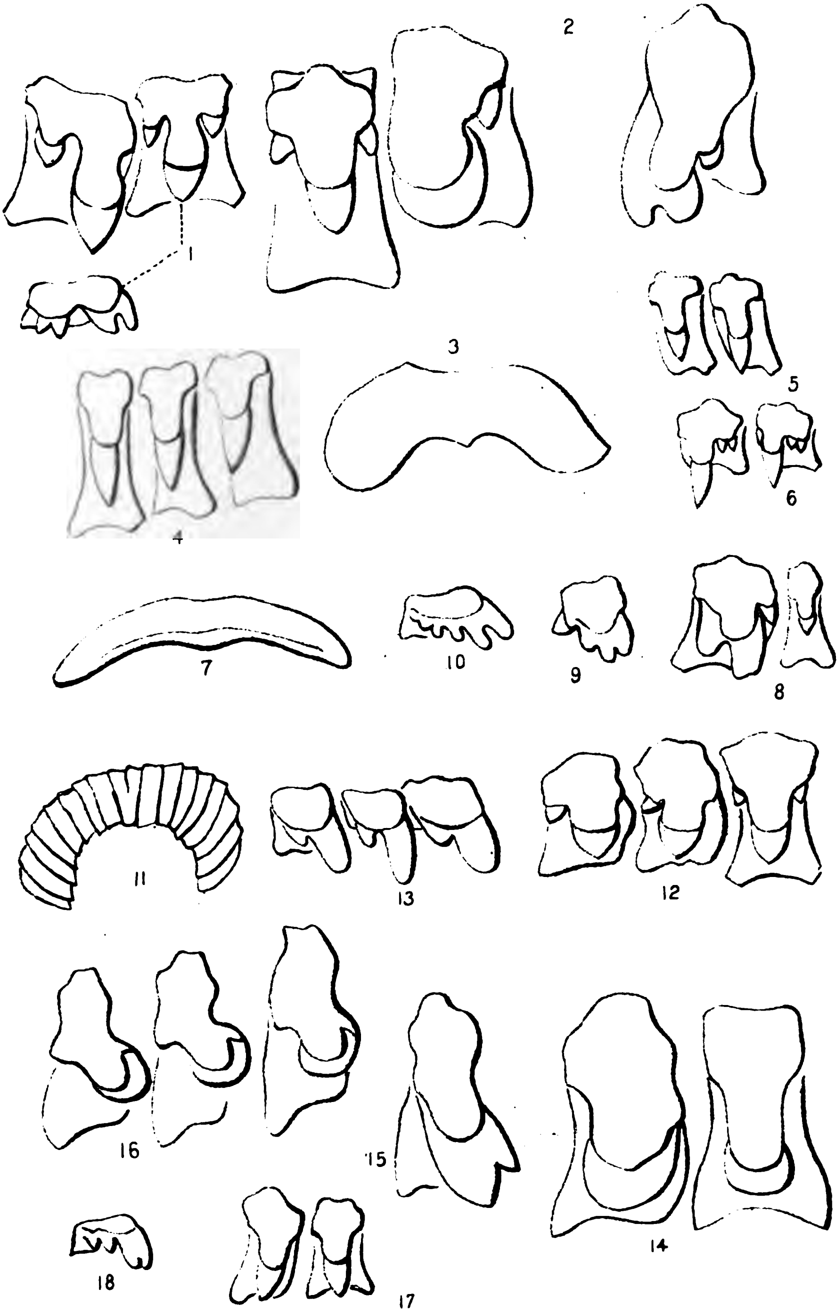

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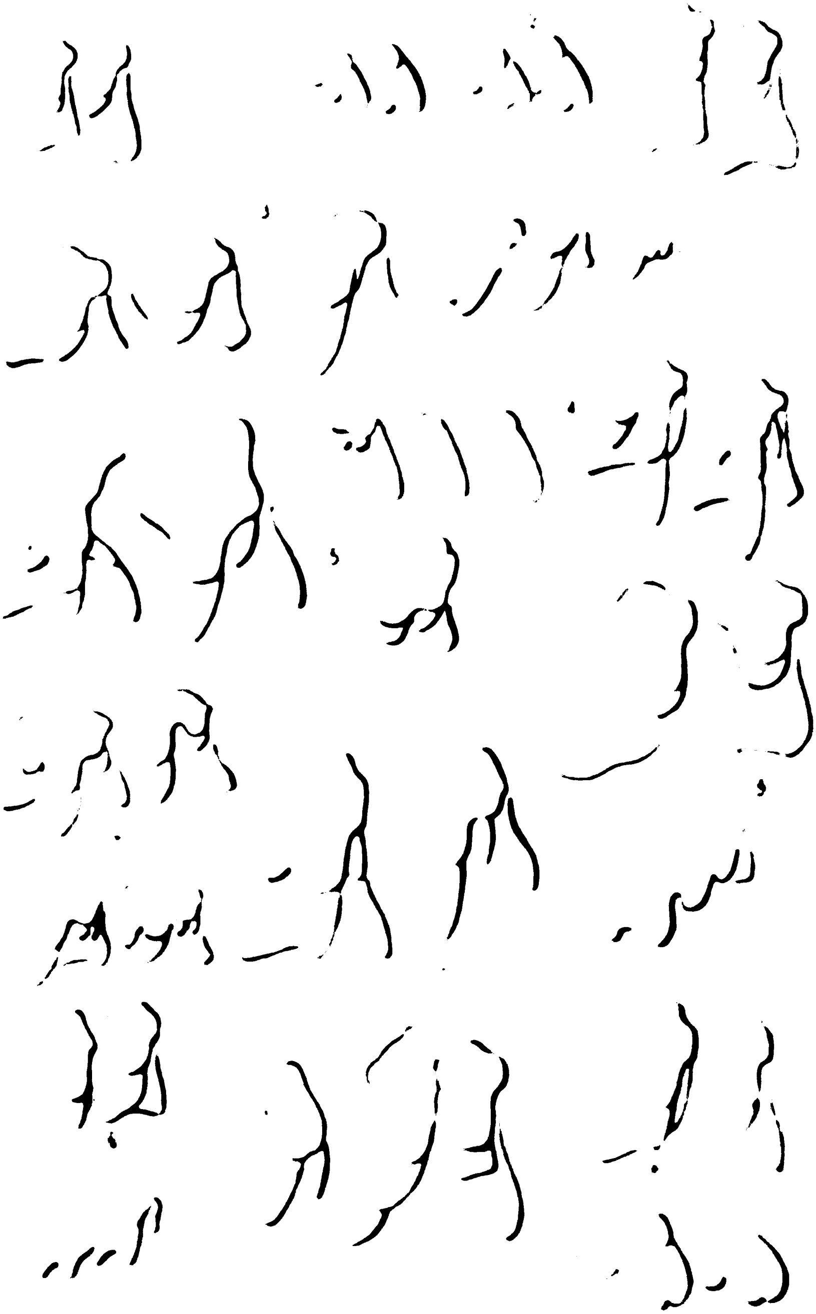
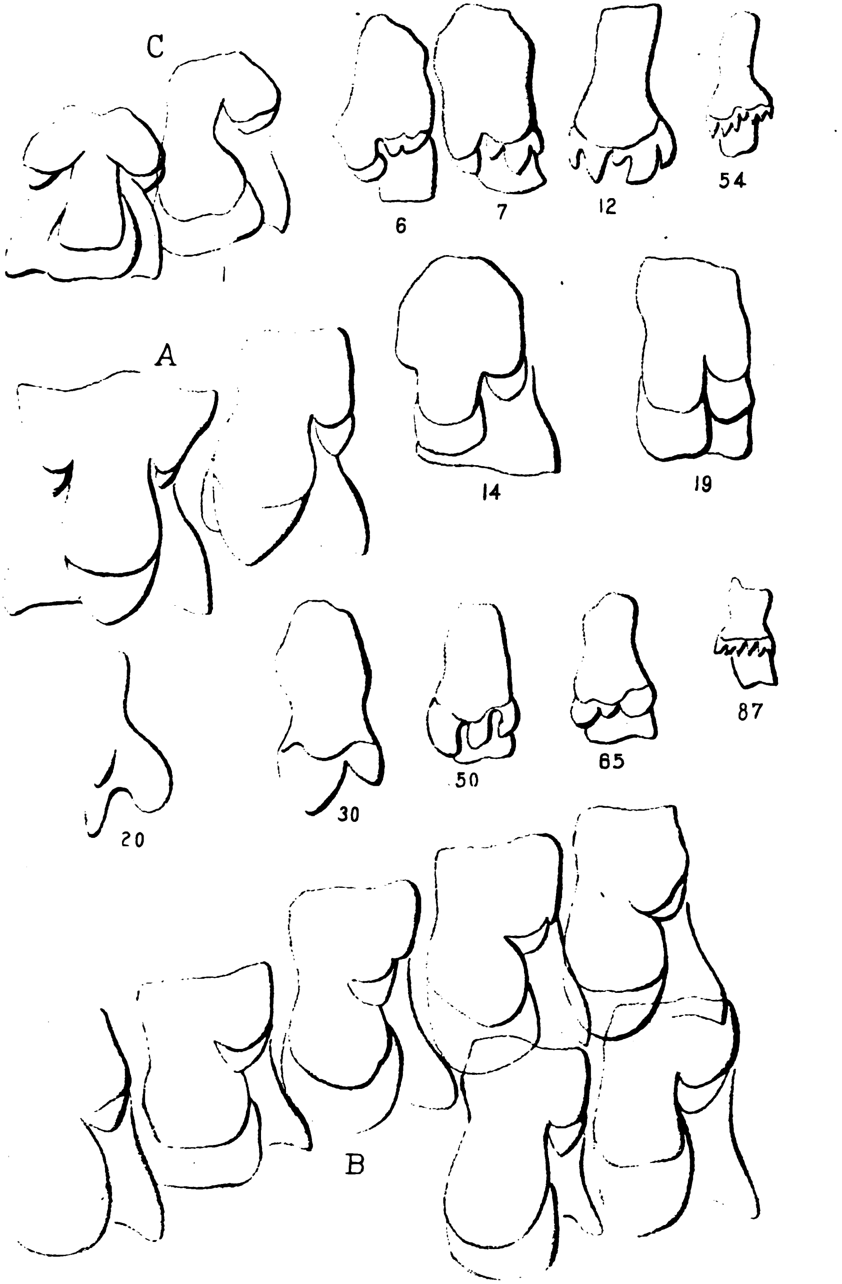
J. H. Bufford's Sons Lith. Boston.





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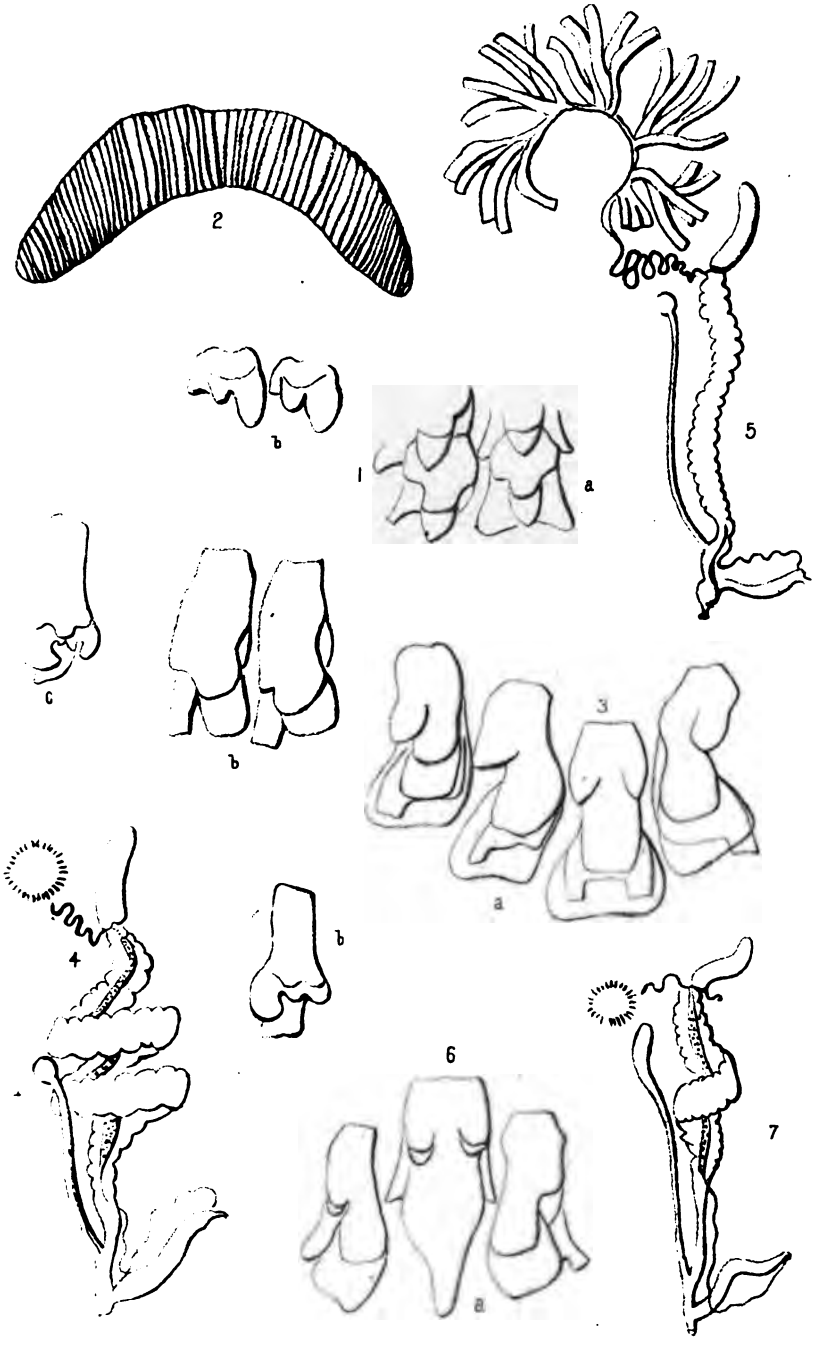
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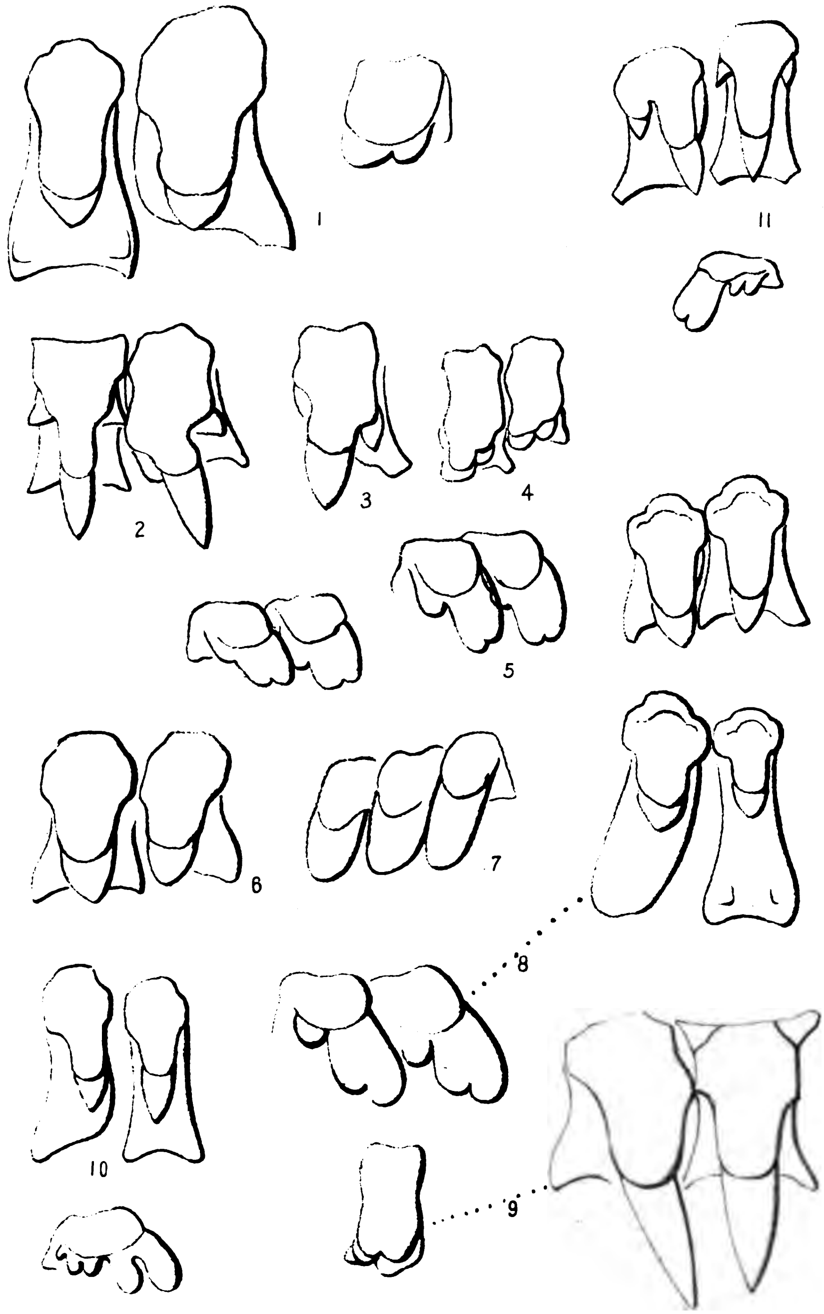

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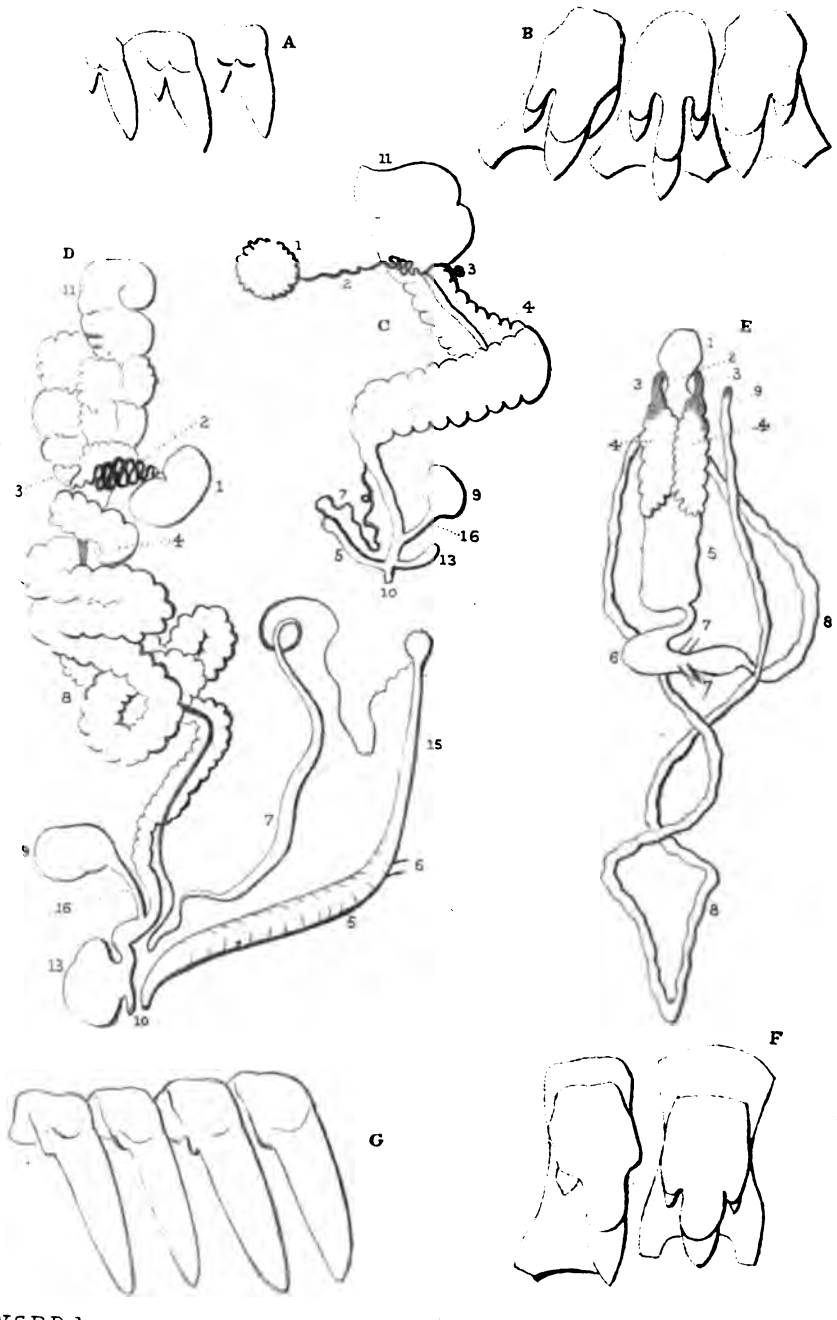
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lens, I could detect nothing more. When small fragments of irregular form were placed under a more powerful magnifier, the black mica appeared smoky by a transmitted light, or green when in very thin plates, and most of the material seemed to be a green amorphous glass, having no effect on polarized light. The specific gravity I found to be 2.48. The silica I determined by an analysis to be 65.48 per cent. We might presume that the amount of silica should be greater than that obtained, but we must keep in mind that the biotite present contains only about 40 per cent. of it, and thus reduces the proportion; however, the quantity indicates that we must class this lava among the acidic ones. The conclusion at which I arrive is that the so-called "blue gravel" of California is a conglomerate of pebbles of various kinds cemented together by an acidic lava in which crystals of mica (biotite) and grains of gold are imbedded.

How the gold came into the lava is a question of some difficulty. Whether it was mingled with the pebbles before the lava ran over the bed, or whether the gold was ejected from the volcano, I am not able to decide. It would require observations on a variety of specimens to arrive at some plausible theory. The specimens I have seen had the gold suspended in the lava. The metal did not touch the pebbles; therefore, if the gold was present in the pebble bed prior to the ejection of the lava, this latter must have raised the metal from its bed, that is to say, a metal of s. g. 19.3 must have been raised by a semifluid mass having s. g. = 2.48!

Of course my observations are limited on these questions, but since copper was ejected by the ancient volcano on Lake Superior, may not gold have been similarly ejected in the case before us?

APRIL 14.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-two members present.

Prof. LEIDY called attention to the "Bulletin of the United States Geological and Geographical Survey of the Territories, No. 2," presented this evening. It contains a "Review of the Vertebrata of the Cretaceous Period found west of the Mississippi River," by Prof. Cope. In this article he was quoted in such a way as not fairly to express his original meaning. Thus, on page 7 of the Bulletin, reference is made to the Proceedings of this Academy, 1856, p. 312, in which it is intimated that Thespesius occidentalis was referred to the Mammalia, and regarded, perhaps, as a Dinosaurian. In the Proceedings I have rather expressed the reverse, as I state of T. occidentalis, "among the collection of vertebrate remains, are two apparent caudal vertebræ a first phalanx of some huge animal, which I suspect to be a

April 7.

Dr. Jos. Leidy in the chair.

Sixteen members present.

The Blue Gravel of California. By E. Goldsmith.—Under the name of "Blue Gravel" the California gold miners, and especially the placer miners, understand a rock which underlies the goldbearing alluvium of that State and part of Nevada. Specimens of this rock were shown to me by John C. Trautwine, C. E. It is stated that, whenever the goldbearing sand in many localities in the two above-named States has been removed by the well-known washing process, the "blue gravel" appears. It also contains gold, which cannot, however, be extracted by washing, the stream of water being unable to disintegrate the rock, which is a compact composite one, and not, as the name "gravel" would imply, a loose material.

This so-called "blue gravel" is composed of two ingredients widely differing in age, namely, of pebbles cemented together by a lava. The pebbles are of all sizes. In the specimens alluded to, they are very smooth and rounded, and present no sharp edges or grooves. Their color is externally brownish, with a slight yellow or olive green, but without the least trace of blue. When a pebble is scraped or cut with a knife, the fresh exposed surface is bluish-gray. The hardness is 4. From the general appearance I infer that some of these pebbles were derived from the sedimentary rock, slate, and others from Hornblende rock.

Entirely different in general aspect from the rounded pebbles is the other part of the rock, which I have already stated to be a lava. This appears to envelop the pebbles completely. When we detach a pebble from the enveloping mass, a perfect impression of the same is observed, having a beautiful lustre as if it had been freshly oiled. This oily lustre, indeed, characterizes the entire enveloping mass. Some of the dull pebbles are as it were externally polished by a coating of the volcanic glass which has run over them. The lustre of the freshly exposed surfaces is brilliant, but it sometimes loses its brilliancy and becomes dull with handling. The color is dirty olive-green. This lava is very brittle, so much so that the preparation of a thin plate for microscopical observation is impossible. The hardness is equal to apatite.

The most distinguishing crystallization within the lava mass is a black mica, which is probably biotite. I noticed also a few grains of quartz, as well as flattened grains of bright yellow gold. These are all observable by the naked eye, and, with the pocket

APRIL 28.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

On Echinorhynchus moniliformis.—Dr. H. C. CHAPMAN made the following remarks: I take the opportunity of exhibiting specimens of the rare and interesting worm the *Echinorhynchus moniliformis* from the alimentary canal of the Fox Squirrel (*Sciurus vulpinus*) known to occur also in the Hamster and Field Mouse. This species is so called from its resembling a row of pearls; its posterior portion is, however, smooth. The color of the worm is white. The characteristic snout is armed with about a dozen rows of recurved hooks, which enables the worm to hold on to the animal which it infests. This proboscis is retractile, being moved by delicate muscles. The male is much smaller than the female, and can be readily distinguished by the sac at its posterior extremity, which serves as a receptacle for the penis. In this species the testicles occupy only a small portion of the posterior part of the animal, while the ovaries, filled with eggs, extend through the entire length of the body. The female in this species attains a length of eleven inches, the male only that of from four to five. The Echinorhynchus is a member of the Acanthocephali or "Spiney Heads," a family of round worms.

There not being a quorum present for the transaction of business, the meeting adjourned until May 5, when the following were elected members:—

Reuben Haines, G. Schwartz, Galloway C. Morris, John N. Coles, M.D., U. S. Navy, Hugh Hamilton, M.D., and Charles P. Perot.

Don Antonio del Castillo, Don Mariano Bárcena, and Don José Joaquin Arriaga, of Mexico, were elected correspondents.

MAY 5.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

The following papers were presented for publication:—

"On the Habits of some American Species of Birds and other things Ornithological." By Thos. G. Gentry.

Dinosaurian, though they may have belonged to a mammalian." I may add that, on p. 8, Prof. Cope, quoting from the same Proceedings, p. 89, indicated that I had referred Ischyrotherium to a Sirenian. This is so, but Prof. Cope appears to have overlooked the more full account of the animal in the Trans. of the Am. Phil. Soc., 1859, p. 151, in which, though I still refer it with doubt to the mammalia sirenia, I state that the remains may have belonged to an aquatic reptile.

In view of the reptilian character of Ischyrotherium, Prof. C. has changed the name to Ischyrosaurus, but his reason for doing so appears to me not to be valid, as classical authorities at times have included reptiles in the word *therion*, and it has been considered admissible as applied to the extinct Cheirotherium.

April 21.

The President, Dr. Ruschenberger, in the chair.

Eighteen members present.

Note on the Enemies of Difflugia.—Prof. Leidy remarked that in the relationship of *Difflugia* and *Amœba* we would suppose that the former had been evolved from the latter, and that its stone house would protect it from enemies to which the *Amœba* would be most exposed. The *Difflugia* had many enemies. I have repeatedly observed an *Amœba* with a swallowed *Arcella*, but never with a *Difflugia*. Worms destroy many of the latter, and I have frequently observed them within the intestine of *Nais*, *Pristina*, *Chætogaster*, and *Æolosoma*. I was surprised to find that *Stentor polymorphus* was also fond of *Difflugia*, and I have frequently observed this animalcule containing them. On one occasion I accidentally fixed a *Stentor* by pressing down the cover of an animalcule cage on a *Difflugia*, which it had swallowed. The *Stentor* contracted, and suddenly elongated, and repeated these movements until it had split three-fourths the length of its body through, and had torn itself loose from the fastened *Difflugia*. Nor did the *Stentor* suffer from this laceration of its body, for in the course of several hours each half became separated as a distinct individual.

Remarks on a supposed Compound derived from Leather.—Prof. Leidy directed attention to a dark-red, compact, shining, resinous-looking mass, several inches in thickness, which, he said, was reputed to have been derived from leather in the great fire of Chicago. It now exhibits no evidence of organized structure, and its origin would not have been suspected from its appearance. On burning it still gives out the peculiar odor of burning leather. It was supposed to be a compound evolved from the leather, under the influence of high heat with absence of air.

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The President, Dr. RUSCHENBERGER, in the chair.

Thirty members present.

The following papers were presented for publication:—

"On the Habits of some American Species of Birds and other things Ornithological." By Thos. G. Gentry.

"Description of two new Fossil Shells from the Upper Amazon." By T. A. Conrad.

Analysis of Graphite from Wythe County, Virginia. By E. GOLDSMITH.—Of all the varieties of Graphite that have come under my notice, I have never seen any resembling that which was given to me recently by Mr. John C. Trautwine, C. E. It is compact massive; the touch is smooth. If cut with a knife or scratched with the finger nail, it shows a bright dark metallic lustre. The fracture is rough, uneven, dull. The color is dark blue, so that the mineral greatly resembles the massive earthy vivianite of New Jersey. The powder has the same color.

Talc makes an impression on it, hence its softness is less than one. Lines drawn with it on paper are of a dark gray hue, similar to common soft lead pencil marks. Specific gravity = 2.1068. The blowpipe reactions, as well as my qualitative analysis, showed that beside the carbon a large proportion of silica, alumina, and iron oxides, also a trace of manganese, were present. The mineral contains a considerable amount of gas, the quantity and reactions of which I had not the means to ascertain.

The quantitative determinations of the amount of moisture and gases, the carbon, and ashes were found in the same manner as is usually adopted in the analysis of anthracite.

These were the results:—

Carbon	29.12.
Ashes	60.61.
Gases and moisture . . .	10.27.

Showing that the mineral may be regarded as a very impure graphite.

MAY 12.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-seven members present.

Notice of some New Fresh-water Rhizopods.—Prof. LEIDY remarked that besides the ordinary species of *Amœba*, which he had observed in the vicinity of Philadelphia, he had discovered what he suspected to be a new generic form. It has all the essential characters of Amœba, but in addition is provided with tufts of tail-like appendages or rays, from which he proposed to name the genus OURAMŒBA.

The rays project from what may be regarded as the back part of the body as the animal always moves or progresses in advance of the position of those appendages. The rays are quite different from pseudopods, or the delicate rays of the Actinophryens.

They are not used in securing food, nor is their function obvious. The *Ouramœba* moves like an ordinary *Amœba*, and obtains its food in the same manner. The tail-like rays are not retractile, and they are rigid and coarse compared with those of Actinophryens. They are simple or unbranched, except at their origin, and they are cylindrical, of uniform breadth, and less uniform length. When torn from the body they are observed to originate from a common stock attached to a rounded eminence.

Several forms of the *Ouramœba* were observed, but it is uncertain whether they pertain to one or several species. One of the forms had an oblong ovoid body about the $\frac{1}{3}$th of a line long and $\frac{1}{12}$th of a line broad. The tail-like rays formed half a dozen tufts, measuring in length about the width of the body. The latter was so gorged with large diatomes, such as *Navicula viridis*, together with desmids and confervæ, that the existence of a nucleus could not be ascertained. The species may be distinguished with the name of OURAMŒBA VORAX.

A second form, perhaps of a different species, moved actively and extended its broad pseudopods like *Amœba princeps*. When first viewed beneath the microscope it appeared irregularly globular and about the $\frac{1}{14}$th of a line in diameter. It elongated to the $\frac{1}{8}$th of a line, and moved with its tail-like appendages in the rear. These appendages formed five tufts about the $\frac{1}{25}$th of a line long. The interior of the body exhibited a large contractile vesicle and a discoid nucleus. This second form may be distinguished with the name of OURAMŒBA LAPSA.

Another *Ouramœba* had two comparatively short tufts of rays, and a fourth, of smaller size than the others, had a single tuft of three moniliform rays.

It is possible that *Ouramœba* is the same as the *Plagiophrys* of Claparede, though the description of this does not apply to that.

Plagiophrys is said to be an Actinophryen, furnished with a bundle of rays emanating from a single point of the body, but the rays are described as of the same kind and use as those of *Actinophrys*. *Plagiophrys* is further stated to be provided with a distinct tegument like *Corycia* of Dujardin, or *Pamphagus* of Bailey, but the body of *Ouramœba* is as free from any investment as an ordinary *Amœba*, and the rays are fixed tail-like appendages with no power of elongation or contraction.

The species of *Ouramœba* were found among desmids and diatomes, on the surface of the mud at the bottom of a pond, near Darby Creek, on the Philadelphia and West Chester Railroad.

Two of the commonest species of *Difflugia* of our neighborhood I had until recently confounded together as *D. proteiformis*, and, perhaps, the two forms may be included under the latter name in Europe. In one the mouth is deeply trilobed, and the animal is usually green with chlorophyl globules. In the other the mouth

is crenulate, usually with six shallow crenulations, and the animal is devoid of chlorophyl. The former is usually the smaller, and may be distinguished with the name of D. LOBOSTOMA; the latter may be named D. CRENULATA.

In an old brick pond, on the grounds of Swarthmore College, Delaware County, among *Difflugia pyriformis*, *D. spiralis*, *D. corona*, *D. acuminata*, and others not yet determined, there occurs an abundance of a large species, apparently undescribed. It is sometimes the fourth of a line in length, and is compressed pyriform, but is quite variable in its relation of length to breadth, and in the shape of the fundus of the shell. This is often trilobate, but from the non-production of one or more or all the lobes, differs in appearance in different individuals. The animal is filled with chlorophyl grains, from which it might be named D. ENTOCHLORIS.

Another large *Difflugia*, allied to *D. lageniformis*, is not unfrequent about Philadelphia. The shell is beautifully vase-like in shape. It has an oval or sub-spherical body with a constricted neck, and a recurved lip to the mouth. The body of the shell opposite the mouth is acute and often acuminate. The animal contains no chlorophyl. One shell measured $\frac{1}{6}$ of a line long by $\frac{1}{8}$ of a line broad; another measured $\frac{1}{4}$ of a line long by $\frac{1}{7}$ of a line broad. The species may be named D. AMPHORA.

A Difflugian, found in a spring on Darby Creek, is interesting, from its transparency, which allows the structure of the animal to be seen in all its details. The investment is membranous and apparently structureless. The soft granular contents occupy about one-half of the investment, and are connected with this by long threads. The pseudopods are protruded in finger-like processes. The form of the animal is compressed ovoid, with the narrow pole truncate and forming the transversely oval mouth. It is probably the species *Difflugia ligata*, described by Mr. Tatem, of England. Its length is about $\frac{1}{3}\frac{1}{3}$d of a line. The character of the investment is so different from that of ordinary Difflugians that the species may be regarded as pertaining to another genus, for which the name of CATHARIA would be appropriate.

Dr. CHAPMAN made the following remarks on the *generative apparatus of the Tebennophorus Carolinensis*:—

Various have been the interpretations offered from time to time of the generative organs of the Gasteropoda. Thus Cuvier considered what is now regarded as an hermaphroditic organ to be the ovary. Later observers regarded this hermaphroditic organ as the testicle, and considered what is now supposed to be an albuminous gland the ovary, and which Cuvier regarded as part of the testicle. With reference to these views, I have recently dissected the Tebennophorus Carolinensis, a slug found often in our environs under trees, etc., and found both ova and spermatozoa in the organ regarded first as simply the ovary, later as the

testicle. I take the opportunity of acknowledging the assistance afforded me in my dissection by Dr. Leidy's beautiful monograph on the Gasteropoda.

MAY 19.

Dr. KENDERDINE in the chair.

Twenty-five members present.

The Veins of Beech and Hornbean Leaves.—Mr. THOMAS MEEHAN said that De Candolle had noticed some years since a difference in the venation between the *Fagus ferruginea* and *Fagus sylvatica*, the common American and European beeches. In the American beech the lateral veins were said to terminate in the apex of the serratures—in the European they terminate at the base of the sinus. He had not read the original paper of De Candolle, but abstracts in the scientific serials. As the statement stood, it conveyed the idea that there was a marked difference in structure between these two allied species which did not, however, exist, as growing in this country the leaves of the European beech are almost entire; the lateral veins, in approaching the margin of the leaves, curve upwards, and connect with the lateral above them, forming a sort of marginal vein near the outer edge of the leaf. The veins of the American beech curve upward in the same way, but are early arrested, and this sudden cessation of growth produces the serra, which are slightly curved upwards. An early arrestation of growth in the veins makes the serratures, and constitutes the only difference between the two species. The structural plan is the same in both—the European, curving its lateral vein into the apex, reached the upper one—the American terminating abruptly.

There was a greater tendency to marginal development in some European than in allied American species. In the *Carpinus Betulus*, the English Hornbean, there were from four to five teeth between each pair of lateral nerves, while there were but from two to three between those of the American—*Carpinus Americana*—a character that was quite as distinctive between these two very closely allied species, as the viens were in the case of the beech.

Direct Growth Force.—Mr. MEEHAN referred to some potatoes exhibited by him to the Academy a few years ago, in which the stolons of a grass had penetrated through from one side to the other, preferring, as it would seem, to go through such an obstruction to turning aside to avoid it. A potato was a rather rough surfaced body. He now exhibited a similar case, only the obstruction was the round smooth root of an herbaceous peony. Though not more than one-third of an inch thick and round, a

stolon of *Triticum repens*, the common couch grass, had pushed itself through.

MAY 26.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

Thos. Hockley, Wm. A. Stokes, John Shallcross, Alfred G. Reed, M.D., Richard J. Dunglison, M.D., Louis A. Godey, and J. E. Kingsley were elected members.

On report of the Committee to which it had been referred, the following paper was ordered to be published.

DESCRIPTION OF TWO NEW FOSSIL SHELLS OF THE UPPER AMAZON.

BY T. A. CONRAD.

The Pebas group of the Upper Amazon was first discovered by Prof. James Orton in 1867, who obtained a collection of the remarkable shells, some of which were first described by Mr. Gabb. Subsequently, at request of Prof. Orton, Mr. Hauxwell collected other specimens, and Prof. Steere obtained some new species, besides a very large number of several species of PACHYDON. Prof. Orton, having revisited the region in which the Pebas group occurs, has found two new forms which he has forwarded to me to describe. These new shells belong to fresh-water genera, and help to define the nature of the habitat of the group. They confirm the opinion I advanced in the preceding paper, that it was a basin of fresh water to which brackish water had access at times. The HEMISINUS herein described occurs crowded in the clay in such perfection that the species must have lived and died on the spot, and as the living shells of the genus inhabit fresh-water rivers of South America, very far from salt water, they are as much fresh-water shells as are those of MELANIA. Some of the shells are water-worn, and there is abundance of small fragments of shells in the clay, in which respect it resembles some of the Miocene beds of Virginia. The Pebas clay in all the localities is crowded with specimens of *Isæa Ortoni*, *I. lintea*, *Liris laqueata*, all of which I believe to be fresh-water shells of the family *Melaniidæ*.

The two shells described in this paper were found at Iquitos, about 100 miles west of Pebas.

Family UNIONIDÆ.

HAPLOTHÆRUS, Conrad.

Equivalve, hinge margin straight, the cartilage area very broad and thick, hinge edentulous, anterior muscular scar small, narrow, and deeply impressed, accessory situated under the primary scar.

This is a large, very thick shell, laminated and pearly like Unio, and is remarkable for the thick, broad hinge area. It comes in fragments, so that the entire outline is unknown. The anterior accessory scar is differently situated from that in ANODONTA,

which is on the posterior side of the primary impression. The latter is very much smaller than in an ANODONTA of the same size.

H. capax. Pl. 12, figs. 1, 2, 3.

Ovate, ? thick and ponderous, inflated; umbo prominent, rounded; beaks distant from anterior extremity; valves somewhat contracted near the middle towards the base.

Prof. Orton remarks that he saw many fragments of this shell, and, therefore, it probably lived in company with Pachydon, but the lamina of the shell separate so readily that fragments only are obtainable. The shape of the shell is evidently somewhat like that of a TRIQUETRA.

HEMISINUS, Swainson.

H. tuberculiferus. Pl. 12, fig. 4.

Turreted, elongated, volutions 9, laterally straight; 3 prominent revolving tuberculated ribs on each volution of the spire, except two or three nearest the apex; last volution with 9 or 10 revolving lines, unequal in size; a fine carinated line borders the upper margin of the suture, which is indistinctly defined; aperture short.

A beautiful species, very distinct from any living shell of the genus. It occurs often very perfect, with the exception of the labrum, which is broken, in every specimen I have seen, from the chalky nature of the shell, not generally from attrition.

PACHYDON, Gabb.

P. tenuis. Pl. 12, fig. 5.

Outlines representing extremes of variation.

P. ——. Pl. 12, fig. 6.

As there is only one specimen of this form, I am uncertain whether it is a distinct species or a variety of *P. tenuis*.

In my last paper, for *Mylitoides* read *Mytilopsis*.

JUNE 2.

The President, Dr. RUSCHENBERGER, in the chair.

Eighteen members present.

The thanks of the Academy were tendered to Mr. Alfred B. Durand for a life-sized portrait of his father, the late Elias Durand, presented this evening.

Habits of the Orchard Oriole.—Mr. THOMAS MEEHAN stated that he was not familiar with the latest knowledge in ornithology, that not being a special study with him; but if *Wilson's Ornithology* contained all that was known of the habits of the orchard oriole—*Oriolus mutatus*—he might say that the bird did not confine itself solely to insect food. He had on his grounds a large specimen of the *Staphylea trifolia*, which, when in bloom, was a favorite resort with humblebees and humming-birds, and the oriole took its share of honey from the flowers as well. It did not rest on the wing as the humming-bird did, but sought a lower branch from which it could leisurely extract the sweets from the flowers above. He had thought it possible that the bird was in search of insects among the flowers, but a careful examination proved otherwise.

Poisonous character of the Flowers of Wistaria Sinensis.—Mr. MEEHAN remarked that there was a popular belief that the flowers of the *Wistaria sinensis* were destructive to bees. He had himself seen hundreds of dead bees under large flowering plants. He was struck with the fact this season, that none were dead under similar circumstances. The flowers were continually visited by the honey bee, and others, without, so far as he could see, any fatal results following. It was clear, therefore, that, whatever might be the cause of the death of these insects under some circumstances, it could not be from the honey alone.

Growth of the Cuicus arvensis, Hoff.—In regard to the rapidity with which plants sometimes grew, Mr. THOMAS MEEHAN observed that, though it was well known that the Canada thistle spread surprisingly, there had been no figures, giving its exact growth, placed on record. In the first week in May, 1873, he sowed a few seeds. By the first week in June the little plants were well above the ground, and about to push out their stolons. They continued to radiate from this centre in every direction till the first week in September, when they had reached a distance of six feet, covering a circle of twelve feet in diameter, the space being

profusely filled with plants thrown up from the creeping stolons. This gave an average of about three-fourths of an inch of growth per day; equal to maize or other rapid-growing vegetation above ground.

JUNE 9.

Prof. Jos. LEIDY in the chair.

Sixteen members present.

Prof. PERSIFOR FRAZER, Jr., made the following remarks:—

During a recent trip to Missouri I had an opportunity of visiting and personally examining the Pilot Knob, and Iron Mountain, and Mine La Motte districts, in company with two of the assistant geologists—Prof. Potter and Mr. Gage. There is much in this district, and in fact in most parts of Missouri, to interest the student of geology from east of the Alleghanies: for example, the variations in the character of the porphyry, which is the archæan according to Prof. Pumpelly, or the azoic member of the Missouri series. This porphyry carries several deposits of ore, both veins and beds, as has been ably pointed out in the recent geological survey of the State by Prof. Pumpelly. This, and the magnesian limestones which overlie it, form the principal part of the surface in the southeastern part of the State.

Mine La Motte is situated in St. Francois County, about ninety miles nearly due south of St. Louis. There are extensive works put up on this property, and the whole was sold to an English company two years ago for $3,000,000, but the sale could not be ratified owing to a law of Missouri which prohibits foreigners from holding property in that State. At least such was the information given to me. The deposits of lead and copper and nickel ores at Mine La Motte, part of a great belt about one hundred miles wide which crosses the State from southeast to northwest, lie in the limestone. At Mine La Motte there is a profuse occurrence of nickel-bearing minerals, and especially of millerite, which is found in stellate, acicular, and radial crystals on the surface of many of the lumps of ore.

The works here, before they were burned down, treated the ores in open American hearths, and brought out matt which was shipped to Swansea. It is said, on competent authority, that a galena exhibiting a peculiar blue color (like that found on the surface of much peacock ore), contains cobalt. The cause of this color, and also its connection with the contained metal, are not perfectly understood. Almost all of the galena of the district is colored in this way.

I present also specimens of iron ore from Iron Mountain, Missouri, where it occurs in irregular veins, intersecting the por-

phyry mountain in all directions. This mountain covers at its base about seventy acres, more or less, and is furrowed by deep cuts near its summit; some of these to a depth of eighty to one hundred feet. The best and purest ore is that which was found lying on the surface of its slopes, and of this there is still a very large quantity; but the large boulders have been almost all removed, while that which remains is so finely divided and so mixed with the clay and soil that any ordinary method of separation would make it too expensive.

Lately, the California hydraulic mining has been applied to win this ore, with great success. Water is pumped through large hoses which are led up the sides of the hills, and the debris is washed down through sluice-boxes and over small falls, which agitate it sufficiently to shake the ore from the dirt and allow it to deposit at the foot of the hill by virtue of its higher specific gravity, in receptacles provided for it. The remaining ore is obtained by blasting, is loaded on a gravity railway and carried to the foot of the mountain, where it is dumped, three or four tons at a time, over a shoot which precipitates it some eight or ten feet, upon the flats of the Iron Mountain Railroad Company, which are awaiting it. The shock as this heavy weight strikes the cars is great enough to cause them sometimes to tilt over on two wheels. How much it increases the wear and tear I was unable to ascertain.

This ore contains from 65 to 68 per cent. metallic iron, associated with 0.031 per cent. to 0.11 per cent. phosphorus and 4 to 4.5 per cent. silica, and a trace of sulphur. The quantity exposed is enormous, but was stated by Mr. David Thomas, of Catasauqua, not to equal in quantity the celebrated Cornwall mines of this State.

The ore from Pilot Knob is much more sandy than that from Iron Mountain. It occurs in a bed dipping with the general dip of the country rock, and inclosed within the porphyry out of which the knob is formed. The formation of this ore is a most interesting study, and the only plausible theory seems to be that of lateral replacement, a case of metasomatism where the porphyry, having become slaty in structure, and less capable of resisting the solvent, has been replaced along the line of strike, and only in such laminated parts. This ore is banded in appearance, and is almost, if not quite, invariably hematite.

JUNE 16.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-five members present.

Notice of some Fresh-water and Terrestrial Rhizopods.—Prof. LEIDY stated that among the amœboid forms noticed by him in

the vicinity of our city, there was one especially remarkable for the comparatively enormous quantity of quartzose sand which it swallowed with its food. The animal might be viewed as a bag of sand! It is a sluggish creature, and when at rest appears as an opaque white, spherical ball, ranging from $\frac{1}{8}$ to $\frac{3}{8}$ of a line in diameter. The animal moves slowly, first assuming an oval and then a clavate form. In the oval form one measured $\frac{3}{5}$ of a line long by $\frac{2}{5}$ of a line broad, and when it became clavate it was $\frac{3}{5}$ of a line long by $\frac{1}{8}$ of a line broad at the advanced thick end. Another, in the clavate form, measured $\frac{1}{8}$ of a line long by $\frac{1}{3}$ of a line wide at the thick end. The creature rolls or extends in advance while it contracts behind. Unless under pressure it puts forth no pseudopods, and the granular entosarc usually follows closely on the limits of the extending ectosarc. Generally the animal drags after it a quantity of adherent dirt attached to a papillated or villous discoid projection of the body.

The contents of the animal besides the granular matter and many globules of the entosarc, consists of diatomes, desmids, and confervæ, together with a larger proportion of angular particles of transparent and mostly colorless quartz. Treated with strong mineral acids so as to destroy all the soft parts, the animal leaves behind more than half its bulk of quartzose sand.

The species may be named AMŒBA SABULOSA, and is probably a member of the genus *Pelomyxa*, of Dr. Greef (*Archiv f. Mik. Anat.*, x, 1873, 51).

The animal was first found on the muddy bottom of a pond, on Dr. George Smith's place, in Upper Darby, Delaware County, but has been found also in ponds in New Jersey.

When the animal was first noticed with its multitude of sand particles, it suggested the probability that it might pertain to a stage of life of *Difflugia*, and that by the fixation of the quartz particles in the exterior, the case of the latter would be formed. This is conjectural and not confirmed by any observation.

A minute amœboid animal found, on *Spirogyra*, in a ditch at Cooper's Point, opposite Philadelphia, is of interesting character. The body is hemispherical, yellowish, and consists of a granular entosarc with a number of scattered and well-defined globules, besides a large contractile vesicle. From the body there extends a broad zone, which is colorless and so exceedingly delicate that it requires a power of 600 diameters to see it favorably. By this zone the animal glides over the surface. As delicate as it is, it evidently possesses a regular structure, though it was not resolved under the best powers of the microscope. The structure probably consists of globular granules of uniform size alternating with one another, so that the disk at times appears crossed by delicate lines, and at others as if finely and regularly punctated. The body of the animal measures from $\frac{1}{66}$ to $\frac{1}{50}$ of a line in diameter, and the zone is from $\frac{1}{333}$ to $\frac{1}{100}$ of a line wide. The species may be named AMŒBA ZONALIS.

The interesting researches of Prof. Richard Greef, of Marburg, published in the second volume of Schultze's *Archiv f. Mikroskopische Anatomie*, on Amœbæ living in the earth (*Ueber einige in der Erde lebende Amœben, etc.*), led me to look in similar positions for Rhizopods.

In the earth about the roots of mosses growing in the crevices of the bricks of our city pavements, in damp places, besides finding several species of *Amœba*, together with abundance of the common wheel-animalcule, *Rotifer vulgaris*, I had the good fortune to discover a species of *Gromia*. I say good fortune, for it is with the utmost pleasure I have watched this curious creature for hours together. The genus was discovered and well described by Dujardin, from two species, one of which, *G. oviformis*, was found in the seas of France; the other, the *G. fluviatilis*, in the River Seine.

Imagine an animal, like one of our autumnal spiders stationed at the centre of its well-spread net; imagine every thread of this net to be a living extension of the animal, elongating, branching, and becoming confluent so as to form a most intricate net; and imagine every thread to exhibit actively moving currents of a viscid liquid both outward and inward, carrying along particles of food and dirt, and you have some idea of the general character of a *Gromia*.

The *Gromia* of our pavements is a spherical cream-colored body, about the $\frac{1}{16}$th of a line in diameter. When detached from its position and placed in water, in a few minutes it projects in all directions a most wonderful and intricate net. Along the threads of this net float minute naviculæ from the neighborhood, like boats in the current of a stream, until reaching the central mass they are there swallowed. Particles of dirt are also collected from all directions and are accumulated around the animal, and when the accumulation is sufficient to protect it, the web is withdrawn and nothing apparently will again induce the animal to produce it.

From these observations we may suppose that the GROMIA TERRICOLA, as I propose to name the species, during dry weather remains quiescent and concealed among accumulated dirt in the crevices of our pavements, but that in rains or wet weather the little creature puts forth its living net which becomes so many avenues along which food is conveyed to the body. As the neighborhood becomes dry, the net is withdrawn to await another rain. The animal with its extended net can cover an area of nearly half a line in diameter. The threads of the net are less than the $\frac{1}{3000}$th of an inch in diameter.

Remarks on the Revivification of Rotifer vulgaris.—Prof. LEIDY remarked that during the search for Rhizopods, having noticed among the dirt adhering to the mosses in the crevices of

our pavements many individuals of the common wheel-animalcule, *Rotifer vulgaris*, he had made some observations relating to the assertion that they might be revivified on moistening them after they had been dried up.

Two glass slides, containing, beneath cover glasses, some dirt, exhibited each about a dozen active living Rotifers. The glass slides were placed on a window ledge of my study, the thermometer standing at 80°. In the course of half an hour the water on the slides was dried up and the dirt collected in ridges. The next morning, about twelve hours after drying the slides, they were placed beneath the microscope. Water was applied and the materials on the slides closely examined. On each slide a number of apparently dried Rotifers were observed. These imbibed water and expanded, and some of them in the course of half an hour revived and exhibited their usual movements, but others remained motionless to the last.

The same slides were again submitted to drying, and from one of them the cover glass was removed. They were examined the next day, but several hours after moistening them only two Rotifers were noticed moving on each slide.

I next prepared a slide on which there were upwards of twenty actively moving Rotifers, and exposed it to the hot sun during the afternoon. On examination of the slide the following morning, after moistening the material, all the Rotifers continued motionless, and remained so to the last moment.

From these observations it would appear that the Rotifers and their associates became inactive in comparatively dry positions and may be revived on supplying them with more moisture, but when the animals are actually dried they are incapable of being revivified. Moisture adheres tenaciously to earth, and Rotifers may rest in the earth, like the *Lepidosiren*, until returning waters restore them to activity.

Prof. COPE mentioned the capture of a young *Balæna cisarctica*, of forty-eight feet in length, in the Raritan River, near South Amboy, on May 30th. The skeleton was buried and would be preserved in some museum. He examined the whalebone, of which there are 245 laminæ on each side of the mouth. The color is black and the hair is fine, long, and has a brownish tinge; length of longest plate with hair, 48 inches. The gum is 116 inches long and 11 inches deep. He was informed that the whale was entirely black, and the dorsal line without irregularities.

Prof. COPE exhibited mounted crania of some gigantic horned mammalia of the Miocene of Colorado, viz., the *Symborodon bucco*, *S. altirostris*, *S. acer*, *and S. trigonoceros*. He explained the distinctive features of this genus as compared with *Titanotherium*, exhibiting typical specimens of the latter from the Academy's museum, showing four inferior incisor teeth, while the

lower jaw of *Symborodon* does not possess any. He pointed out that these animals had small brains, with few convolutions, which were separated by deep fissures occupied by thin bony laminæ, and that the falx and tentorium are well developed. He pointed out the relatively small size of the brain, and that at least half of the length of the cranium is occupied by enormous, undivided frontal sinuses. Each of these communicates with the nasal meatus by an elongate foramen, and enters the base of the corresponding horn core. He stated that similar sinuses exist in the cranium of *Eobasileus*, and enter the basis of the middle pair of horns in the same manner.

JUNE 23.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-one members present.

On the Pelvis of Hadrosaurus.—Prof. B. WATERHOUSE HAWKINS, having completed his model of Hadrosaurus at Princeton College, took the occasion to call the attention of the Academy to his success in placing certain fugitive bones belonging to Hadrosaurus, and also to its English cousin Iguanodon. It might be allowable to remind the meeting of the fact that in 1868, when he had made and presented the restoration of Hadrosaurus now in the museum, he then recognized the homologous character of a bone described by Dr. Leidy in his monograph of the Cretaceous Reptiles, to that which had become a fugitive bone in Iguanodon, the English representative of Hadrosaurus. These bones had been for many years appointed to the place of clavicles by Prof. Owen and Dr. Mantel, of England. When Mr. Hawkins made his large restoration of Iguanodon at the Crystal Palace, in 1853, his first difficulty was to find room for these so-called clavicles in his model, a task which he was obliged to abandon, as they were twice the size which the natural arrangement of the limbs rendered possible. A few days previous to his sailing for America he found that Prof. Huxley had been studying the same problem of their true position in the animal's body, concerning which he delivered an address before the Royal Institution. Prof. Huxley, on this occasion, transposed the pseudo-clavicles from the pectoral to the pelvic arch, where he arranged them either as pubic or ischiatic bones, and placed them as in the ostrich and rhea. At the same time this transposition was taken advantage of to suggest the probability of Iguanodon walking on its hind legs, thus accounting for some of the larger forms of bipedal footprints, and justifying the establishment of the new order Ornithosauria. On the arrival of Prof. Hawkins in America, after studying Dr. Leidy's description of Hadrosaurus, he found that Dr. L. had anticipated

Prof. Huxley's transposition of the pseudo-clavicles, which he suggested in the above-named description might more probably represent the ischiatic bones of Hadrosaurus. While engaged in the Central Park, in developing the external form of this former inhabitant of New Jersey, Mr. Hawkins found it necessary to renew the whole question as to the component parts of the pelvic arch of these giants, which he practically tested with casts from the actual fossils, endeavoring to ascertain their true position according to both Dr. Leidy's and Prof. Huxley's views. In this attempt he utterly failed, finding it impossible to place these fugitive bones in such relationship to the gigantic femur as would enable either animal to make footprints similar to those found both in England and America. This being the case at the moment when the iconoclastic Central Park Commission declined allowing the further prosecution of paleozoic studies in the Park, the inquiry was not continued until the opportunity was afforded by the trustees of the New Jersey College at Princeton, who desired to possess for their new museum one of Mr. Hawkins's restorations of an extinct animal of New Jersey. For this purpose they selected Hadrosaurus, which enabled Mr. H. to again investigate the true position of the bones in question, which he has finally placed as the analogues of the abdominal plastron-like supports, found largely developed in the pelvic region of the alligator. This position of the bones, when united with the bipedal carriage of the body, suggested immediately an analogy between these fugitive bones and marsupial bones of the Didelphidæ. These remarks were illustrated by Mr. Hawkins in his usual manner by crayon drawings on the slate.

Prof. COPE stated that he was still of the opinion that the evidence derived from *Lælops* and *Megadactylus* rendered it necessary to believe in the backward direction of these bones in *Hadrosaurus*.

Prof. COPE described a species of Dipnoan fish of the genus *Ctenodus* from the coal measures of Ohio, based on specimens placed in his hands by Prof. Newberry, as follows:—

The top of the head is covered with angular plates or scuta, arranged in the following manner on the region presented. Two symmetrical scuta occupy the median line, one in front of the other. One of these is a longish coffin-shaped hexagonal, with the suture with the other concave. The latter is more ovoid, broad and convex next the first mentioned, and somewhat more contracted at the opposite extremity. Beyond this are two shields joining by a straight suture on the middle line; besides this one, they have two concave sutures for scuta, at the farther end two concave lateral sutures, and a straight one to the adjoining median scutum, whose suture is also concave. On each side of this median plate is a large area surrounded before outwards, and

behind, by smaller scuta, three in front, two at the side, and two behind. Commencing with the first, No. 1 has already been described. No. 2 is small, oval, and antero-posterior; No. 3 is an antero-posterior pentagon, with the narrowest side inwards. No. 4 is a similar transverse pentagon. No. 5 is an antero-posterior pentagon, which presents its shorter lateral facet inwards. No. 6 has a similar character, but is smaller and with more definite angles. Another series of scuta is seen outside of these at one end of the series. Three of this set bound the front and side of each of the median pair above mentioned, leaving a short facet next its fellow unaccounted for. The sculpture consists of radiating ridges and tubercles, which are most broken near the centres of the scuta. The tubercles and ridges are obtuse and low, and the latter do not inosculate. An angular depression commenced at the middle of each lateral area, and extends across the middle line at the point of junction of the paired and single median scuta.

	M.
Width of vertex at middle scuta	0.176
Length of single median scute	.048

JUNE 30.

The President, Dr. RUSCHENBERGER, in the chair.

Fifteen members present.

Permission having been granted (the meeting being for business), Prof. PERSIFOR FRAZER, Jr., made the following remarks:—

In the investigation of the chemical formulas of minerals, the student will meet with two kinds of difficulties. The first is the great variations in the analysis, and the next is the connecting together in the formula for the particular mineral of different compounds by the sign +. The first of these difficulties is a necessary consequence of the manner of formation and occurrence of minerals in the midst of solutions of other materials, and consequently subjected to mechanical and chemical conditions tending to add impurities to it, (whether by percolations through its open joints, crevices, and pores, or by oxidizing or partially decomposing it).

The first results of the best processes of mechanical separation merely reduce to a low per cent. the admixture of one mineral with another of greatly different sp. gr., and even the best known chemical methods can never succeed in producing an absolutely and theoretically pure substance. So much less probable is it that the deposits of compounds by the mechanical and chemical processes which a change of the conditions of the surrounding nature have caused, and which have not been bottled up in impervious glass jars, but left to the action of the rain and sun and subter-

ranean solutions, should even acquire more than a relative purity. So that when we glance over the analysis of the same mineral made by different chemists, it is often hard to say which elements are those characteristic of the species. (*See Glauconite, Conarite, Beudantite, etc. etc.*)

In some cases, the admixture of the two minerals can be proved to be mechanical (*gold dust in magnetic sand*); in others it is merely strongly suspected, but the mineral cannot be separated by mechanical means (*gold in pyrites, etc.*), while in the great majority of cases the formula maker contents himself with two arrangements of the atoms present connected by the sign +, and each representing a different mineral.

It is this that forms one of the greatest difficulties to the student, at the present state of science, in forming any probable conception of the mutual chemical relations of the various elements represented. Such an hypothesis is certainly tenable in two cases: 1st. When the resulting mass cannot be classed under any of the crystal systems (*limonite, etc.*) and the mineral is set down as amorphous or crystalline; and 2d. Where the percentage of one or two of the supposed compounds is so small that the morphological properties of that which greatly preponderates are assumed by the whole mass. (*Quartz containing scales of specular iron or needles of rutilite.*) But when a mineral crystallizes distinctly in one crystal system and is deliberately assumed to be made up of two others, each crystallizing in a different one, the case is exceedingly perplexing to the mind. Yet the greater number of all the formulas determined by chemists exhibit this anomaly.

It was not surprising that this should be the case at a time when the electro-polar theory of Berzelius was unquestioned, and the bases and acids were placed opposite each other—frequently separated by the + sign—like the partners in a Virginia Reel, and it was thought necessary to make them analogous by dividing the oxygen between them. CaO, SO_3 (*anhydrite*) or CaO + SO_3 which has a crystal form differing from that of SO_3 and CaO seems to justify $(Ag_2S)_3 + Sb_2S_3$ (*proustite*), for in this latter case the mineral is rhombohedral (hexagonal) while one of its constituents crystallizes isometric and the other rhombic. It is true that this mineral belongs to the class of those of metallic habit, and is therefore opaque, and thus its optical properties cannot be determined, but if it were transparent we should be under the necessity of recognizing the power of a mineral which can only produce the ordinarily refracted ray + one that can produce two extraordinary rays to form a mineral which can give rise to one extraordinary ray, and so of pleochroism, etc. In this case the fancy is pleased by the accidental coincidence of the crystal form of the resultant with the average of the other two $\frac{0+2}{2}=1$; but we

know there is no basis for such a thought, and besides in other cases the union of two simply crystallizing minerals produces one of more complex morphology.

Thus our authorities tell us that sternbergite which crystallizes orthorombic is to be written chemically $Ag_2S + (FeS)_4 + FeS_2$, or in other words, is composed of three minerals, two of which (Ag_2S *and* FeS_2) crystallize in the isometric system, and the third has no place in nature and no name.

I propose at a future meeting of the Academy to call the attention of the mineralogists to several formulas which, though new, seem to fulfil all the conditions of agreement with analysis and the newest developments of theoretical chemistry.

The following anatomical notes by Dr. CHAPMAN were read:—

Disposition of the Latissimus Dorsi, etc., in Ateles Geoffroyi (Kuhl) and Macacus Rhesus (Desmarest).—Frequently the attention of anatomists is called to the abnormal arrangement of parts, such as variations in the disposition of muscles, arteries, etc., and by comparison with other animals what is abnormal, variable, in a higher animal is usually found to be normal, constant, in a lower one. Supposing the theory of the evolution of life to be true, that the higher animals are the modified descendants of the lower, we have some explanation for the occurrence of such abnormalties, these variations being reversions to ancestral types. An interesting illustration of this view is seen in the occasional occurrence in man of a muscular slip, running from the latissimus dorsi to the internal condyle of the humerus. This muscle, which is of very rare occurrence in the human subject, is constant in monkeys, among others in the spider monkey or Ateles, as shown in Plate 13, Fig. 1 (*b*). Another variation met with so frequently in the human subject that surgeons have their attention called to it with reference to the ligation of the main arteries, is the presence of a muscular slip, passing from the latissimus dorsi across the axillary artery and nerves to the pectoralis major. This muscle, Plate 13, Fig. 2 (*c*), is constant in the Macacus, which also exhibits the muscular slip (*b*), just referred to in Ateles. On the supposition that man and the monkeys are the descendants of a common stock, we may expect to find such variations recurring like other family traits.

Flexor Brevis Digitorum in Ateles Geoffroyi (Rube).—I take the opportunity of calling attention to the arrangement of the flexor brevis digitorum in a spider monkey, the Ateles Geoffroyi. By looking at Plate 14, we see that tendons 1 and 2 are the continuation of the muscular belly rising from the calcaneum, that tendon 3 results from the union of two muscular slips, one from (*a*), the other from the tendinous portion of the flexor longus digitorum, while tendon 4 comes only from tendon of flexor longus digitorum. This arrangement of the tendon of the flexor brevis digitorum is somewhat different from that observed in other New World mon-

keys (Platyrrhini and Arctoppithecini) or those of the Old World (Catarrhini).

Rete Mirabile in Bradypus Didactylus.—Of the many peculiarities in the organizations of the sloths, one of the most interesting is the breaking up of the arteries into rete mirabile. This is well seen in the upper extremity of a two-toed sloth (*Bradypus Didactylus*) which recently died at the Zoological Garden, Philadelphia. While the axillary artery is seen to continue its course as the brachial, diminished, however, in its calibre, it gives off numerous branches which divide and subdivide. The main artery with the surrounding plexus and the median nerve passes through the internal condyle of the humerus, Plate 13, Fig. 3. In this latter respect it differs from the three-toed sloth, as may be seen by comparison with the beautiful plates of Prof. Hyrtl. This interesting disposition of the bloodvessels is also seen in the femoral arteries of these animals. Various explanations have been offered for the rete mirabile of arteries. Thus in the Cetacea the dividing and subdividing of the arteries appear to serve as reservoirs of arterialized blood, enabling such animals as the porpoise, etc., to remain for a long time under water. In the sloths and slow lemurs this disposition of the bloodvessels seems to be in relation with the slowness of the circulation, fluids travelling less rapidly through a number of small vessels than one large one.

On report of the Committee to which it was referred, the following paper was ordered to be published:—

ON HABITS OF SOME AMERICAN SPECIES OF BIRDS.

BY THOS. G. GENTRY.

The body of facts contained herein is the result of observations carried through a period of four consecutive seasons, and is confined to species which, though of extended range, breed within the State of Pennsylvania. This paper is designed to cover the ground from the Family Icteridæ to the end of the Family Picariæ, exclusive of western species and a few whose habits have been described by the writer in the forthcoming work of Dr. Coues.

Family ICTERIDÆ.

Subfamily AGELÆINÆ.

Molothrus pecoris, Swainson.

This well-known species, though an early visitor in Massachusetts, which, according to the authority of Samuels, makes its appearance there as early as the middle of March, from some cause or other has never been observed by the writer earlier than the second week of April, long after the blue-birds, robins, and blackbirds have made the fields and woods resound with their music. Its arrival is announced by the coming of the warblers and sparrows, between whom and it exists such mysterious relations. The anomalous habit which the female possesses of visiting the nests of smaller species of birds when she wishes to deposit her eggs, and thus shifting a responsibility which she should alone assume, is familar to all. There is no doubt that primitively all species were as equally social and gregarious in their habits as the cow-bird of to-day; and that the present system of mating, which is surely an index of a high state of improvement, has been gradually evolved. The art of nest-building has doubtless also been slowly acquired. In some families it has attained a wonderful degree of perfection, while in others it may be said to be in its infancy. With the cow-bird either it has never been studied, so to speak, or else it is a lost art which the species has never been able to regain.

The species of birds which seem to be the objects of its special regard, are comprehended within the three great families of the *Sylvicolidæ*, *Vireonidæ*, and *Fringillidæ; Geothlypis trichas*,

Cab.; *Vireo olivaceus*, Vieil.; *V. novaboracensis*, Bonap; *Cyanospiza cyanea*, Baird; and *Melospiza melodia*, Baird. Why the small birds should be the recipients of such unsolicited favors it would be difficult to guess, unless the cowardly spirit of the species under consideration operates to prevent similar discourtesies being shown where they would probably be resented. As a proof of said cowardice, might be cited the stealthy manner in which the female approaches the nest of any of the above species. She is ever on the alert for fear of detection by the rightful owners. In case of discovery she takes to flight, sometimes failing to complete her work; but when suddenly pressed, she is compelled to drop her egg. This will account for the eggs which are occasionally seen either entire or broken upon the ground. It is said that the egg of the cow-bird hatches rather sooner than those of the birds among which it is found, and from this it is argued by some, that it is a wise provision of nature, which, were it otherwise ordered, would defeat the end she had in view. The writer knows from experience that sometimes a nest of eggs is a longer time in hatching than at others; the difference of time being the evident result of variation in the amount of heat to which they are subjected. Now, the egg of the cow-bird being perceptibly larger than the others, would receive more heat from the body of the female than the latter's own, for the simple reason that it is in closer proximity to the source of heat. This seems to be a satisfactory explanation of its much shorter period of incubation. Were the eggs hatched by their rightful author, there is no doubt that the time would vary but a trifle, if any, from that of the rusty black-bird.

Agelaieus phœniceus, Vieil.

At the time of writing, March 24th, not a single individual of this species is to be seen, while the purple grakle is found in prodigious numbers. About the first of April is the usual time of its appearance with us. Like the crow-black-bird, it is fond of society, many pairs being observed building within a few paces of each other in the same swamp or meadow. Occasionally a nest is constructed within a tussock of grass, but generally upon the alder bushes so common along the borders of meadow streams, where the eggs and young are less liable to the attacks of snakes, particularly *Bascanion constrictor* and *Tropidonotus sipedon* which seem to have such a decided penchant for such fare.

In structure those found upon bushes are finer and more compact. On the exterior are observed occasional patches of mud. While those built upon the small mounds in swampy situations are surrounded by tall overarching grasses, and have in consequence a looseness of arrangement which in general will scarcely bear manipulation.

In the selection of a locality there is manifest an evidence of design. High grounds are seldom chosen for nidification, for the obvious reason that the birds are not so apt to meet with such a ready and full supply of the various species of insects which pander to their appetites and those of their young as in the former situations. The insects which afford them a living in such localities, are the aquatic larvæ of ephemerids, dragonflies, and mosquitoes which are found in the small shallow pools so abundant therein; together with mature forms of the same—a variety which the most fastidious *bon vivant* among the *aves* cannot fail to appreciate.

It has been affirmed that the red wings are destructive to farmers' crops, but as far as the writer's experience extends, the damage which they do is small in comparison with the good which they accomplish. When a cornfield is in close proximity to a meadow, it is probable that a few grains may be exhumed, or a few tender shoots uprooted, in early spring, but I am certain that the birds during the breeding season are so strongly attached to the meadows that they are reluctant to leave them. In the fall of the year they may visit the cornfields and pluck a few grains from the standing shocks, but in view of the manifold advantages gained by the myriads of insects destroyed, we should not grudge them a mere pittance of corn, since, at this season of the year, they are doubtless productive of immense good in the destruction of various coleopterous and lepidopterous larvæ.

Sturnella magna, Swainson.

This beautiful species, though quite common in this latitude during the breeding season, according to the writer's observations makes its appearance from the first to the fifteenth of April. It is not gregarious in early spring like the purple grakle, but arrives from the south already paired for the essential duties of nidification and incubation. It does not commence building operations, however, earlier than the last of April or the beginning of May; the interval of time being employed, judging from the manœuvres of the birds, in the selection of a desirable and suit-

able locality. The site chosen is, as is well known, a meadow. Samuels affirms, "the locality is generally in a meadow or low field." I have as often found the nest on upland in a field of red clover or one of timothy grass. In such situations it reposes in a concavity of the earth, partially hidden and protected by enveloping and over-arching grasses. Nuttall's description thereof, though correct in his day, according to the writer's experience needs some modification. As the nest of the same species varies with a change of locality, this difference may be attributed thereto. According to that eminent authority "it is compact, made of wiry grass, to which a hidden and almost winding path is made, and generally so well concealed that the nest is only to be found when the bird is flushed." I have always observed a looseness of arrangement in its structure. The materials out of which it is built are the hollow stems and leaves of *Phleum pratense*. These are accumulated principally in the bottom, to insure protection against the dampness of the ground.

It is seldom that the hen bird can be detected on the nest. When alarmed by approaching footsteps, there is no sudden uprising or whirring of wings as is usual. Aware of danger, she quietly slips out of the nest and noiselessly wends her way through the thicket of grasses, along well-beaten paths which she has made for the purpose.

The food of the meadow lark consists chiefly of larval insects, together with earthworms, beetles, grasshoppers, and the seeds of grasses. Nuttall says it does not appear that it ever adds berries or fruits to its bill of fare. The writer is confident he has seen it feasting upon the small black cherry which is so plentiful during the month of June. The period of incubation is from 14 to 15 days according to various observations.

Subfamily ICTERINÆ.

Icterus spurius, Bonap.

The orchard oriole is quite as common as its near relative. It reaches us from the genial South about the first of May. Samuels, in describing its nest in Massachusetts, says substantially, it is deposited on a forked branch of a tree in an orchard, at an elevation of not more than twenty feet from the ground, and constructed of different grasses neatly and compactly woven together; the whole

being lined with fine grasses and a few hairs. Further, he says, "it is not pensile but built *on* a branch." Its style of architecture varies no doubt with the latitude. Of the many nests which have been examined, including many in the writer's collection, all with but one or two exceptions were of a decidedly pensile character; uniform in texture, and suspended from slender branchlets after the fashion of *Icterus Baltimore*, Dandin. The exceptional cases were placed between the forked branches of trees. These nests, with two exceptions, have been found upon apple and pear trees, in close proximity to the residence of man; the exceptions were noticed on the confines of forests, at considerable distances therefrom. There is no doubt that in earlier times this oriole was as timid and suspicious of man as many other species that might be cited; and that as time advanced it gradually lost all fear. Familiarity with man, the result no doubt of many years' experience, has taught it to regard him in the light of a friend. In the fact that the nest of this species is occasionally found on the borders of immense thickets, we have a clue to its past history. In the writer's opinion, reserve, timidity, and distrust were then the leading elements of its character, while familiarity, a certain degree of boldness and confidence are traits which now stand prominently forth.

A typical nest of the species measures 2½ inches in diameter and 4½ inches in depth. It is pouch-shaped, and attached to the slender twigs of an apple or pear tree in such a manner as to be swayed to and fro by the gentlest breeze. It is built of the soft and flexible leaves of a species of *Poa*, neatly and compactly woven together, and lined on the inner side with much narrower leaves of a closely allied species. The site selected is usually one where the small spurs of the pear and apple, principally the former, with their crowns of leaves can meet over the nest and form a roof to protect the female and young from inclement weather.

During the breeding season its chief food is beetles, flies, lepidoptera, earthworms, and various larvæ. The seeds of grasses are occasionally relished. It is highly insectivorous in its nature. I am not able to say whether it has a fondness for fruits and berries, but am inclined to the belief that it will not refuse a juicy berry if thrown within its way; but that it will not put itself to any inconvenience to obtain the same I am well aware.

In the duties of incubation the male takes no direct part. I

have often observed him bringing food to the female while thus engaged. When the young have developed from the egg, both parents are extremely sedulous in their attention to them until they have attained their feathered stage, when the mother seems to hand them over to the father to initiate into the mysteries of aerial navigation. There is but one brood in the season, as far as I have been able to determine, although I have seen nests in the early part of August with rather tender fledglings. The period of incubation ranges from fourteen to fifteen days.

Family CORVIDÆ.

Corvus Americanus, Audubon.

The above species is very abundant throughout the summer in this section of the country, and the writer has observed through the severest winter weather numberless individuals roosting in the junipers and cedars of the hills of the Wissahickon, when the snow stood several inches upon the ground. The birds commence pairing about the last of April, seldom earlier than the fifteenth, and shortly afterwards commence building. The nests are usually built upon the various species of oaks, and occasionally upon some of Pinus. They are large in dimensions, fully 18 inches in diameter at the base, and from 8 to 10 inches in depth; the thickness of the walls is from 3 to 4 inches. They are constructed of coarse rude sticks externally, of the thickness of a lady's ring finger, mostly fragments of dead branches that had fallen from the oaks and chestnut. Within are smaller twigs of the same covered by a few dried leaves of *Quercus* and *Fagus* to relieve its hardness. All the nests that I have examined, and I have had abundant opportunities, answer to the above description, which will be found to differ materially from others. Usually but one brood is reared in a season; the writer has met with two, but this is of rare occurrence.

Nests have been taken close by the dwellings of man, showing the friendly disposition of the authors. Usually the species is very shy and builds in places seldom visited. When with young the birds are very pugnacious, permitting no intrusion within their jurisdiction. They manifest the most tender regard for their progeny, and exercise the most jealous care over them. Notwithstanding the mischief they commit to the farmers' crops, and their frequent raids to the poultry yards, the good which they accom-

plish in the destruction of noxious insects and small animals should commend them to public favor. Besides subsisting upon insects, small animals, carrion, grass, and fruits, I have in two instances observed individuals, which I took to be males, imitating the habit of their nearest kin, the fish crow, by plying the trade of fishers. There is no doubt that in the case of *Corvus ossifragus*, this habit was similarly acquired by a few birds of more sagacity than others. The period of incubation I have not satisfactorily determined, but am confident that it cannot exceed eighteen days.

Corvus ossifragus.

This species, though assigned to the South Atlantic and Gulf States by Dr. Coues in his Key to North American Birds, has been observed by the writer during the past four years to breed within the rural districts of Philadelphia. Although designated by the same great authority as a maritime species, yet it should be considered only partially so. It has been observed in company with its near relative the common crow, and commences building at the same period. Its nest, unlike that of the crow, is constructed upon a willow, by the side of a watercourse, where it can ply its piscine trade without being molested. Externally, it consists of a few rude sticks as a sort of foundation, upon which a neat and comfortable superstructure, composed of the inner fibrous parts of the red cedar, is placed, loosely arranged, the whole presenting a neater and more fastidious appearance than that of the common crow. The eggs are four in number. The ground-color is a light blue marked with a few dots and blotches of umber-brown on the small end, which are more or less confluent on the large one, obscuring to a considerable extent the background. In size they are but little superior to the eggs of the purple grakle, being about 1.40 in. in length, and .89 in width. In configuration they bear a very close resemblance to those of the great crested Fly Catcher, being almost perfectly oval. There is a marked contrast between the eggs of *ossifragus* and *Americanus* in size, shape, and markings, sufficiently striking to convince one of the distinctness of the two species, even though other details should be wanting. I have never met with more than one brood in a season. It is like its cousin in some points of character, but minus its thievish propensities. A fisher by trade, it holds all other occupations at a discount. It is fond of its young, but has not the

courage to defend them against the attacks of enemies, as the former. Since it breeds usually in out-of-the-way situations, it can give farmers and others but little annoyance. Its period of incubation is similar to that of *Americanus*.

Family TYRANNIDÆ.

Tyrannus Carolinensis, Baird.

The Bee Martin, shortly after its arrival in the latter part of April, commences building. Its nest is ordinarily constructed upon the forked branches of a pear tree in an orchard, or in close proximity thereto. Why the pear tree should be selected in preference to any other, the apple and cherry for examples, it is difficult to imagine, unless the density of its foliage, and the short spine-like twigs with which the branches are armed, afford greater protection; the former from the keen gaze of rapacious birds, and the latter from mischief-seeking and mischief-loving boys. It is usually built near the top of the tree where the denser foliage is found. Occasionally, I have taken nests of this species in places remote from orchards, on the confines of thick forests, a fact which seems to intimate that the habit of building in orchards is an acquired one, brought about in obedience to a change of character in the species. As it has a passion for the little *Apis mellifica* whose hives are found in such situations, there is no doubt that a desire to be near such articles of luxury may have prompted a change, thereby saving unnecessary waste of time in procurement, and giving a better guarantee of success. It is true that the species is proverbial for its pugnacity and pertinacity, not even fearing to attack birds of prey which come within the precincts of the ground over which it exercises sway, and, therefore, the securities which a pear tree throws around are not absolutely necessary. But birds of the least sagacity would not be slow to perceive the advantage which would be gained by the selection of such a site, in the saving of great physical labor. In the vicinity of forests these protective objects are in a measure denied, the birds in consequence making up in bravery. Perhaps a vivid sense of greater danger to their young induces them to give them the advantage of everything protective that wisdom and ingenuity can devise. There is one feature about the nests which have been found in regions unoccupied by man that has not been observed in those adjoining his residence: the entire absence of feathers

and hairs in the interior; these articles being substituted by fine grasses and leaves. The period of incubation ranges from 13 to 14 days according to circumstances.

Myiarchus crinitis, Cab.

This species is very abundant in this latitude, arriving from the South during the early part of May, and shortly afterwards pairing. Both birds engage in nest building. The nest is constructed in a hollow tree, mostly a pear or an apple; no doubt the previous labor of some hard-working wood-pecker, possibly *Colaptes auratus*. Mr. Samuels says, "the nests are composed of straws, leaves, feathers, and the cast-off skins of snakes." He further affirms, "it seems a distinguishing characteristic of the nests of this species, to have the skins of one or more snakes woven into the other materials." This has also been the experience of others. Mine has been quite different. I have yearly collected many nests of this species, and find a great difference in the materials. The following is the aggregate description: Loose in arrangement, with scarcely the slightest evidence of design. To an observer, it seems as if the materials had been dropped into the cavity by the birds, and, when a sufficient quantity had been accumulated, the whole had been shaken together until the ingredients had been thoroughly commingled. Dried grasses, liber of trees, rotten wood, and feathers are the chief constituents; the slough of snakes being an unnoticeable feature. In lieu thereof, I have always found the feathers of the common barnyard fowl to be a characteristic feature thereof.

That this species does not always build in cavities is certain. Two years ago, near Germantown, I found a nest built between the forked branches of an apple tree. It was composed principally of the feathers of chickens, held in place by a woof of long grasses. Though not very compact, yet it was sufficiently so to last during the season. It is doubtful, however, whether it could withstand the peltings of winter. The habit of building within the hollows of trees is doubtless an acquired one, rendered necessary by external circumstances. That species do occasionally vary in the selection of a site for a nest, is instanced by *Turdus migratorius*, Lin., which, as is well known, ordinarily builds its mud-plastered nest within the forked branches of a tree. In the case to which the writer refers, the nest was found upon the hori-

zontal beam of an outhouse, to which the rafters are attached, after the manner of *Sayornis fuscus*, Baird. The case of *M. crinitus* cited above seems to the writer to be a case of reversion of habits.

Why this species alone of all others of the family to which it belongs should seek shelter and protection for its young in the hollows of trees, is hard to divine. We should expect to see in its structure a family resemblance. It is true that it is of a quarrelsome disposition, and as a necessary consequence, gains many enemies. To insure protection for its young against the latter's attacks, it has hit upon the happy expedient of hiding them away in the places designated.

The feathers selected for the nest are mostly white, or of a grayish color, which, with the characteristic hue of the inner bark of trees and the rotten wood that form the bulk of the nest, resemble so closely the ground color of the egg and its markings, that great advantage is gained thereby. The food of this species is mostly bees, beetles, grasshoppers, and lepidoptera. Perched upon a dead branch of a tree, the writer has observed the male bird, for hours, bobbing the head this way and that, then up and down, always on the alert for the beings which form its appropriate diet. During the period when the species is with young, may be noticed similar practices, which, however, are not so prolonged, for the male bird after brief periods of time repairs to the nest with its spoils, which are dealt out to the female and the young according to the character of the food. The period of incubation ranges from 13 to 14 days.

Order PICARIÆ.

Family CAPRIMULGIDÆ.

Subfamily Caprimulginæ.

Antrostomus vociferus, Bonap.

This common and little known species arrives during the early part of May, already paired. It is of a shy and retired disposition, secluding itself during the daytime in close forests, among the leaves or underbrush, only venturing forth during the shadowy twilight in quest of its food, which consists of crepuscular and nocturnal lepidoptera and various species of Phyllophagous beetles. Such a partiality has it for the covert of woods that the

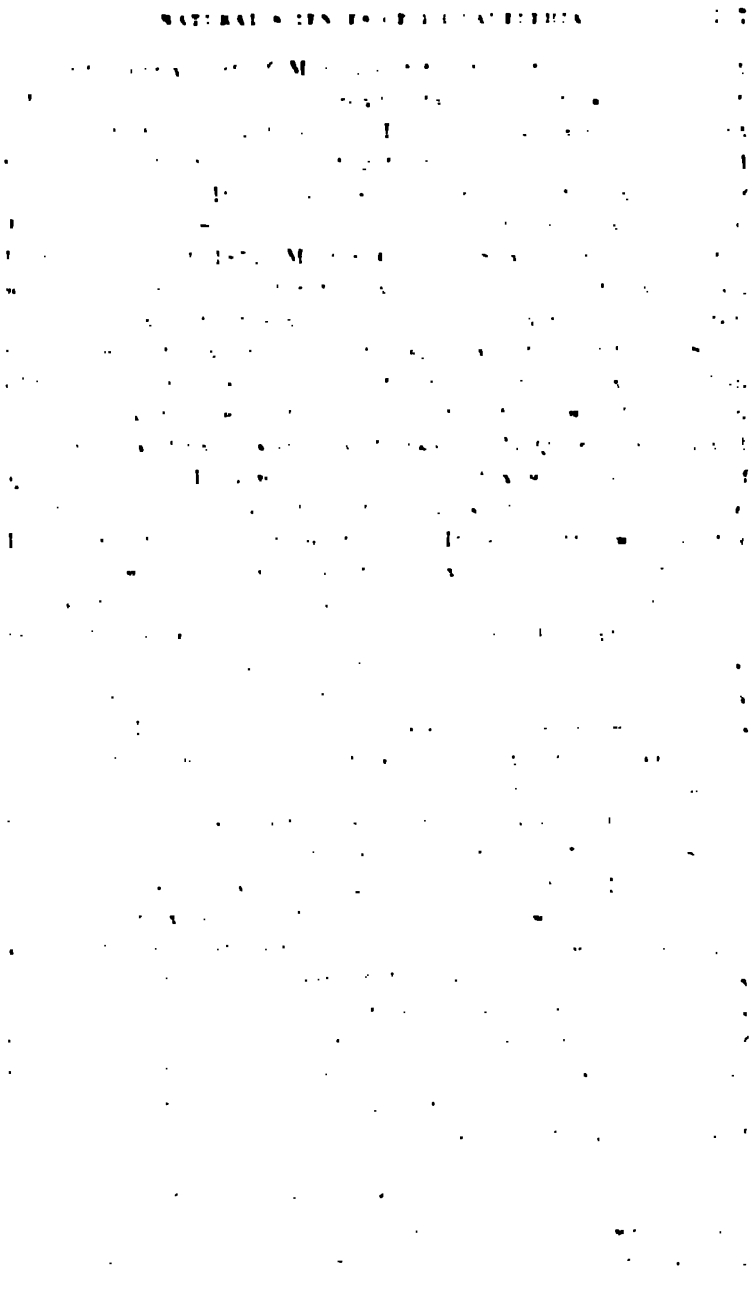
writer has never startled it in the open fields. The dull and sombre shadows cast upon the ground by the fluttering leaves of the trees, with the faint streaks of light that come and go between their interstices, combined with the dark colors of the leaves that repose upon the soil, create a sort of gray light, which beautifully harmonizes with the natural tints of the bird. In my travels I have often observed a whip-poor-will to start up within fifteen paces of me, and after flying a short distance on swift and noiseless pinions, to alight upon the ground. After indicating the spot by a certain bush or fallen limb, I have stealthily approached, straining my vision to its utmost capacity to gain a glimpse of the squatting bird, but before I could gratify my desire, she was up and off again. Time after time has been so spent, but seldom has it been my fortune to witness the consummation of this desire. It has never been my lot to see the male and female together during the period of incubation. The merest apology of a nest is all that is constructed. By the side of a fallen and decayed log, usually on the side where the deepest shadow is found, the female has been observed to deposit her eggs. A slight concavity is scooped out by her, and frequently lined with decayed wood, reduced to a powdered condition, the site being selected where a ready supply of the material is at hand. There is never more than one brood in a season. The period of incubation ranges from fourteen to fifteen days. I have often been surprised while travelling to notice how conscious it is of approaching steps even when the greatest caution is observed to avoid giving alarm. Its visual organs being ill-adapted to the light of day, and even the mellowed light of the woods being too powerful a stimulus, it is certain that it must depend upon other means for the detection of danger. The organ of hearing, which is well developed, is assuredly called into requisition. This species makes its appearance rather late in the season, when the sun has obtained considerable power, and retires early, frequently as early as the 25th of September.

Family TROCHILIDÆ.

Subfamily TROCHILINÆ.

Trochilus colubris, Linn.

This beautiful little species, which is the only one of its family limited to this section of country (E. Penn.), makes its appearance



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during the early part of May, about the time the horse chestnut (*Æsculus hippocastanum*) spreads its rich clusters of fragrant blossoms to the vernal breezes. The small insects which frequent the blossoms for their honey, together with the honey itself, afford it a rich repast. It commences building during the early part of June, both birds working assiduously until the nest is completed. In the spring of 1872, Master Charles Silverthorn, one of the writer's pupils, secured for the latter's collection at least fifteen nests, from a district scarcely one-fourth of a mile in diameter, thus showing the abundance of the species in this latitude. Some of these nests were saddled upon the moss-covered branches of an apple or pear tree, while the major part of them was found upon the branches of various species of oaks, chiefly *Quercus rubra* and *Quercus alba*. They were constructed of a woolly substance of vegetable origin, plucked from the leaves of *Verbascum thapsus*, L., of almost immaculate whiteness. It is doubtful whether the soft down which appears upon the unexpanded leaves of the poplars is utilized, since the leaves are already developed in the generality of cases when nidification commences. The exterior of the nest is compactly covered by a thatching of bluish-colored lichens, possibly a *Parmelia*, glued thereon by a viscid saliva, secreted by the birds. I have never observed, as some, the small woody fibres on the outside, which are said to strengthen the fabric. Occasionally a few cobwebs have been noticed, but the manner in which the lichens cohere seems to be all that is necessary. The nests are usually 1.50 inch in diameter, with a depth of 1.75 inch. Specimens have been taken fully 2 inches in depth. The internal cavity never exceeds $\frac{3}{4}$ of an inch in depth, while instances are known of small nests with less than $\frac{1}{2}$ inch. The writer has taken nests during the latter part of July, with eggs, but whether a second set or not he is unable to say, possibly the work of pairs that have been frustrated in their labors during the early part of the season. During the hatching period the male is in close proximity to the nest, and if any attempt is made to interfere therewith, is foremost and loudest in his cries of resentment, and even flies into the intruder's face with half opened jaws, requiring considerable effort to beat him off. His mate is of a more passive nature. The period of incubation, according to the writer's estimate, is about eight days. So susceptible to cold is the species

that I have known it to leave for the sunny south as early as the 10th of September.

Family CUCULIDÆ.

Subfamily Coccyzinæ.

Coccyzus Americanus.

This species, a very common resident during the warm season, arrives from the south during the latter part of April, and retires to its genial warmth early in the fall, frequently as early as the first of October. In this neighborhood the nest is usually constructed between the forked branches of *Maclura aurantiaca*, at an elevation of about ten feet from the ground. It is composed externally of small sticks and rude grasses, and lined internally with fine grasses. The male bird scarcely forsakes his mate during incubation, save to provide himself and her with food. When not thus engaged, he perches upon a limb of the same tree, within a short distance of the nest, ever watchful of her, and apparently ready to administer to her slightest calls. Feelings of the tenderest sympathy and the most devoted affection are mutually exhibited. It is not shy and timid in disposition, but shows confidence in man by building close to his domains. In the spring of 1872, from my school window I could command a view of a nest of this species, and observe the minutest details of its every-day life. My pupils frequently in their plays would pass underneath the tree, while the birds were engaged in building, but so intent were they upon their work that they heeded not their presence. The nest was completed, eggs were deposited and hatched, and the young matured; the parent birds evidently feeling as secure as in more sequestered situations. Such friendship as is here displayed should strike a sympathetic cord in the bosom of relentless man, and induce him to throw around such unsuspecting creatures the ægis of his protection. The period of incubation is fourteen days. When the female is with young, the duty of feeding devolves upon the male, who, with the instincts of a faithful husband and father, administers with alacrity to their physical wants.

Family PICIDÆ.

Melanerpes erythrocephalus, Sw.

This beautiful species is of rare occurrence in the vicinity of Philadelphia during the breeding season. It is more abundant, however, farther west. In the counties of Union and Northumberland, of the State of Pennsylvania, the writer has observed it in great numbers. There it is the principal species, as *Colaptes auratus*, Swainson, is in the east. It arrives seldom earlier than the first week in May, and soon begins to excavate a cavity in a tree for its nest. The place selected is ordinarily an apple tree close by the habitation of man, but occasionally a more secluded and retired spot. The writer has often observed the nests in the hollows of partially decayed willows upon the margins of ponds. The cavity ranges from ten to twelve inches in depth, being somewhat wider at the bottom than at the entrance; the latter being just wide enough to admit the body of the bird. Dr. Thompson, in his work entitled "Birds of Vermont," affirms that "the larger end of the egg is marked with reddish spots." This variety I have never observed. It may be an exceptional occurrence in more northern latitudes. From Samuels' description of the site selected for nidification, it would seem that this species is of a timid nature. Familiarity with its habits has convinced me that it is remarkably unsuspicious, and courts rather than shuns the society of man. In the month of August, not later than the 10th, in the central part of this State, the writer has seen immense flocks of this bird, numbering hundreds, within an apple orchard, tapping the rough and fissured bark of the trees in quest of the insects that lurk therein. So tame and confiding were they, that it was possible to approach within a few paces of them without exciting suspicion or creating alarm. In the vicinity of the White Deer Mountains, in the county of Union, they abound in immense numbers during the breeding season, and are the objects of protection by the farmers, for the good which they accomplish in the destruction of myriads of insects. The period of incubation ranges from fourteen to fifteen days. The usual complement of eggs is two, occasionally three have been found.

teristics of the simpler compounds which most resemble it, to which of them it owed its morphological properties; and, having decided this question, to write the formula for that mineral as the species, and consider the other as a complex variety of it.

I append some few names of minerals with their old and new rational formulas generally compared, and in addition to the usual method of writing these new formulas I have added that form of graphic symbol which presents fewest typographical difficulties.

Old Formula.	New Formula.
Niccolite.	
$NiAs$	$Ni^{II}=As^{I}-As^{I}=Ni^{II}$ or) (?)
Ni_3As_2	$Ni^{IV}\quad As^{V}-As^{V}\quad Ni^{IV}$ or)
	$As^{III}\quad Ni^{IV}-Ni^{IV}\quad As^{III}$
	$(Ni_2)^{VI}As_2^{III}$
Breithauptite.	
$NiSb$	$(Ni_2)^{VI}Sb_2^{III}$
Ni_3Sb_4	
Bornite.	
$(Cu_2,Fe)S$	$(Cu_2)_4^{II}\quad S_6^{II}\quad (Fe_2)^{IV}$
	$(Cu_2)_3^{II}Fe_2^{VI}S_6$
	(Recalculated from one of the original records of analysis.)
Chalcopyrite.	
$Cu_2S+FeS=FeS_2$ (D)	$(Cu_2)^{II}=S_2^{II}=Fe_2^{VI}\quad S_2^{II}$
usually $Cu_2S+Fe_2S_3$	$(Cu_2)^{II}Fe_2^{VI}S_4$
Barnhardite.	
$2CuS+FeS+FeS_2$	$(Cu_2)_4^{II}\quad S_4^{II}\quad Fe_2^{VI}=S$
	$(Cu_2)_2Fe_2S_5$
Calaverite.	
Au_2Te_4	$Te^{II}-Au^{III}-Te^{II}-Te^{II}-$
	$-Au^{III}\quad Te^{II}$
	$Au^{III}Te_2^{II}-Te_2^{II}Au^{III}$
	$(Au^{III}Te_2^{II})_2$
Miargyrite.	
$Ag_2S+Sb_2S_3$	$Ag^{I}-S^{II}-Sb^{III}=S^{II}$
	$Ag^{I}Sb^{III}S_2^{II}$

these minerals, and while the mass could have no crystal form of its own, the mutual ratios of the resulting compounds would be more constant as the process of decomposition was more perfect.

It often results that in calculating a formula for a so-called species the results of analyses of specimens from widely distant localities, and made by different persons, agree remarkably well together, while the atomic ratio is such as to resist all efforts to bring these atoms into one homogeneous compound Often, too, the student sees clearly that he is dealing with a partially decomposed mass, and would, perhaps, be justified in writing "*a*, per cent. of the mineral A with *b*, per cent. of the mineral B disseminated through it," but it is obvious that he must assign wide limits to *a* and *b*; and if the species possess that patent of genuineness, crystal form, unless he define those limits his formula loses its value.

Take the case of smaltite. This mineral has very well-marked physical properties and unmistakable crystal form, and is an arsenate of cobalt, iron, and nickel, but its per cent. of As varies from 59 per cent. (Salvetal & Wertheim) to about 75 per cent. (Karsten); the Co from 0 per cent. (Rammelsberg) to 20 per cent. (Stromeyer); the Ni from 0 per cent. (Varrentrapp & Stromeyer) to 29.50 (Rammelsberg); the Fe from trace (Rammelsberg) to 18 (von Kobell); Cu from 0 per cent. (Lange, Booth, Karsten, &c.) to 2 per cent. (Jäckel). Besides these very large varieties of composition there are frequently found other elements with it, such as Bi and S. How is a formula to be constructed for such a mineral?

The only recourse is to the R's, and we have no less than four groups of formulas proposed by Dana, under one of which every smaltite yet analyzed can be brought. The first two of these are really identical, and differ only in the different proportions in which the analogous elements Ni, Co, and Fe, replace each other, and may be written RAs_2. But the next group (C) has the formula $RAs + RAs_2$, and the third (D) $RAs_2 + RAs_3$.

Independently of the presumptive evidence against such a mixture producing a beautiful octahedron of smaltite, where is to be the limit to such formulas? Why not $RAs + RAs_2 + RAs_3$ + etc.? And would it not be well to adopt some more definite rule for assigning formulas to minerals of such variable composition?

Without naming these laws certain facts can be assumed on which to base them: 1st. If there is no single chemical formula which expresses the constitution of a crystallized mineral, then that mineral is a mixture. 2d. Its form is determined by the preponderance in quantity or in crystallizing power, or both, of *one* of its constituents. 3d. The mineral can only present its characteristics when the foreign ingredients are present under a given per cent.

The plan would seem to be to deduce from the known charac-

Old Formula.	New Formula.
	Malachite.
$2CuO.CO_2$	$Cu_2^{II}=O_4^{II}=C^{IV}+aq$
	Domeykite.
$(Cu_2)_3As_2$	$As^{III}=(Cu_2)_3^{II}\cdot As^{III}$ $(Cu_2)_3^{II}As_2^{III}$
	Dyscrasite.
Ag_2Sb	$Sb^{V}\ Ag_4$ Calculated from original record of analysis by Rammelsberg (No. 9 in Dana).
	Leucopyrite.
$FeAs_2$	$As^{I}—Fe^{II}—As^{I}$ $Fe^{II}As_2^{I}$
	Linnæite.
$2CoS+CoS_2$	$Co^{II}=S_2^{II}=Co^{IV}=S_2^{II}=Co^{II}$ $Co_3S_4^{II}$
	Skutterudite.
$CoAs_3$	$As_3^{I}\ Co^{IV}—Co^{IV}\ As_3^{I}$ $(Co_2)^{VI}As_6^{I}$
	Sylvanite.
$(Ag,Au)Te_2$	$Ag^{I}Te^{II}—Au^{III}=Te^{II}$ $(Ag^{I}Au^{III})Te_2^{II}$
	Jamesonite.
$2(Pb,Fe)S+Sb_2S_3$	$Pb^{II}=S_2^{II}=Sb^{III}—S^{II}—Pb^{II}—$ $—S^{II}—Sb^{III}=S^{II}$ with Fe replacing Pb, or $Pb_2^{II}Sb_2^{III}S_5^{II}$
	Chalcostibite.
$Cu_2S+Sb_2S_3$	$(Cu_2)^{II}=S_4^{II}—Sb_2^{III}\ S_3^{II}$ $(Cu_2)^{II}(Sb^{III}S_2^{II})_2^{I}$
	Bournonite.
$3(Cu_2,Pb)S+Sb_2S_3$	$Sb^{III}\ S_3^{II}\ Pb_2^{II}—S^{II}—Sb^{III}=$ $=S_2^{II}—(Cu_2)^{II}$ $(Pb_2^{II}(Cu_2)^{II})(Sb^{III}S_3^{II})_2^{III}$

Old Formula. New Formula.

(Antimonial.) Tetrahedrite.

$4CuS + Sb_2S_3$ $(Cu_2)^{II}=S_2^{II}=Sb^{V}-S^{II}-Sb^{V}=S_2^{II}=(Cu_2)^{II}$

S^{II} S^{II}

$(Cu_2)_2{}^{II}Sb_2S_7$

(Arsenical.) Tetrahedrite.

$4CuS + As_2S_3$ $(Cu_2)^{II}=S_2^{II}=As^{V}-S^{II}-As^{V}=S_2^{II}=(Cu_2)^{II}$

S^{II} S^{II}

$(Cu_2)_2{}^{II}As_2S_7$

Wittichenite.

$3Cu_2S + Bi_2S_3$ $S^{II}=Bi^{III}-S^{II}-(Cu_2)_2{}^{II}=$

$=S_3{}^{II}-Bi^{III}$

$(Cu_2)_2{}^{II}Bi_2{}^{III}S_5{}^{II}$

Note.—Dana gives the atomic ratio of Cu : Bi : S : : 3 : 1 : 3. From his seventh record of analysis (by Schneider), however, this ratio is 4 : 2 : 5.

Stromeyerite.

$(Ag,Cu_2)S$ $(Cu_2)^{II}=S_2^{II}=Ag_2^{I}$

$((Cu_2)^{II}Ag_2{}^{I})S_2{}^{II}$

Note.—The atomic ratio expressed in Dana's formula is Ag : Cu : S : : 1 : 2 : 1, whereas from Stromeyer's analysis it appears very clearly as 1 : 1 : 1.

Dufrenite.

Karsten's Analysis D2.

$Fe_2O_3.PO_5 + 3HO$ $O^{II}=Fe_2{}^{VI}=O_3{}^{II}=P^{V}=O^{II}$

O^{II}

$O^{II}=Fe_2{}^{VI}=O_3{}^{II}=P^{V}=O^{II}$ $\Big\} + (H_2O)_5$

$(((Fe_2)_2{}^{VI}O_3)(P^{II}O_4{}^{II})_2{}^{III})_2 + (H_2O)_5$

Libethenite.

$4CuO.PO_5 + HO$ From the atomic ratio.

Cu : P : H : O : : 2 : 1 : 1 : 5

$Cu_2{}^{II}=O_4=P^{V}-O^{II}-H^{I}$

$(HCu_2{}^{II})(P^{V}O_5{}^{II})^{V}$

Olivenite.

$4CuO.(P,As)O_5 + H_2O$ $((H^{I}Cu_2{}^{II})As^{V}O_5{}^{II})_2$

$Cu_2{}^{II}=O_4=As^{V}-O^{II}-H^{I}$

Note.—Some P replaces As.

"Description of a new species of Helix." By Jas. Lewis, M.D.

"On some Batrachia and Nematognathi brought from the Upper Amazon by Prof. Orton." By Edw. D. Cope.

The nomination of Mr. N. E. Macomber as a member of the Academy was offered and accepted.

Prof. COPE stated that the snakes of the genus *Storeria*, B. and G., are viviparous like *Eutænia* and other tropidonotine genera to which they are allied. He had frequently made this observation, but had not placed it on record so far as he knew. He also stated that the Colorado potato beetle had probably terminated in its eastern migration, as it had appeared pretty well distributed in New Jersey the present season.

Prof. COPE gave a synopsis of the result of his work in connection with Hayden's United States Geological Survey of the Territories during the season of 1873. He stated that the investigation covered principally the paleontology of the cretaceous, eocene, miocene, and pliocene periods in Colorado. The whole number of species of vertebrata obtained was one hundred and fifty, of which ninety-five were at the time new to science. The cretaceous species were both terrestrial and marine, and the miocene were most numerous. These numbered seventy-five species, of which fifty-seven were new. They embraced, as especial additions to the fauna, numerous reptiles and *Mammalia* of all the orders, especially *Insectivora*, *Rodentia*, and *Carnivora*. Important additions were the gigantic horned *Symborodons*, and numerous very small ruminants allied to the *Tragulida*. He stated that the discovery of the latter added a stronger resemblance to the miocene of France than had been heretofore supposed to exist. The existence of *Elotherium* and *Anchitherium* gave the fauna somewhat older facies than that of France.

He stated that the only genus of lizards that could be well analyzed is the *Peltosaurus*, Cope, and that this proves to be a member of the existing family of *Cerebomatida*, which is now confined to Mexico and California. Hence, like many rodents, but unlike the higher mammalia, these miocene lizards had continued with but little modification to the present day.

He also discussed the age of the Bridger eocene, stating that it had been originally termed miocene by the geologists of King's survey, and later lower miocene, or upper eocene, by Marsh. He had published it as eocene in 1872, and contended that it presented features which indicate a somewhat earlier age than that of the Paris basin. He said that there were numerous parallels of corresponding genera in the two; the *Mesonyx*, *Palæosyops*, *Hyrachyus*, *Achænodon*, *Hyopsodus*, and *Anaptomorphus*, of the Bridger formation, represented the *Hyænodon*, *Palæotherium*, *Lophiodon*, *Anoplotherium*, *Hyracotherium*, and *Adapis* of the Paris basin

Old Formula. New Formula.

Stephanite.

$5AgS + Sb_2S_3$ $Ag_5^{I} \equiv S_5^{II} \equiv Sb^{V}$

$Ag_5^{I}Sb^{V}S_5^{II}$

Note—Dana's first record of analysis by H. Rose gives atomic ratio of Sb : S : Ag : : 1 : 4.2 : 5.2, but the indications are of a compound as above.

Sartorite.

$PbS + Sb_2S_3$ $Pb^{II} = S_2^{II} = Sb_2^{III} \equiv S_2^{II}$

$Pb^{II}(Sb^{III}S_2^{II})_2$

Brochantite.

From Forchhammer's Analysis (D 3).

$(3CuO.SO_3)_2 + CuO.HO$ The ratio of

Cu : O : S : H : : 3 : 9 : 1 : 6

hence

$Cu_2^{II} \equiv O_4^{II} \equiv S^{VI} = O_2^{II} = Cu^{II} +$

$+ aq$

hence $Cu_3^{II}S^{VI}O_6^{II} + (H_2O)_3$

Change of Habit in Smilacina bifolia.—Mr. THOMAS MEEHAN remarked that this plant, as was well known, was usually terrestrial, preferring generally the vicinity of large trees. It propagates itself by underground stolons, advancing but a few inches each season; the stolons of the preceding year dying as soon as a new one was made. He had recently seen a case where the stolons had advanced from the ground, and up the trunk of a large chestnut tree, to the height of about two feet; the original stolons for several years back having died away, and the plant taken in a purely epiphytal character. The roots and stolons mostly had penetrated the coarse, rough bark of the chestnut tree, the leaves only being chiefly visible. The fact is trifling, and in old times, perhaps, hardly worth recording; but in these days, when the change of character in connection with the evolution of form had such a general interest, even this was worth recording.

JULY 14.

The President, Dr. RUSCHENBERGER, in the chair.

Seven members present.

The following papers were presented for publication:—

"On Fertilization of certain Flowers through Insect Agency, and other Matters Botanical." By Thos. G. Gentry.

"Description of a new species of Helix." By Jas. Lewis, M.D.

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He stated that the only genus of lizards that could be well analyzed is the *Pelosaurus*, Cope, and that this proves to be a member of the existing family of *Gerrhonotidæ*, which is now confined to Mexico and California. Hence, like many rodents, but unlike the higher mammalia, these miocene lizards had continued with but little modification to the present day.

He also discussed the age of the Bridger eocene, stating that it had been originally termed miocene by the geologists of King's survey, and later lower miocene, or upper eocene, by Marsh. He had published it as eocene in 1872, and contended that it presented features which indicate a somewhat earlier age than that of the Paris basin. He said that there were numerous parallels of corresponding genera in the two; the *Mesonyx*, *Palæosyops*, *Hyrachyus*, *Achænodon*, *Hyopsodus*, and *Anaptomorphus*, of the Bridger formation, represented the *Hyænodon*, *Palæotherium*, *Lophiodon*, *Anthracotherium*, *Hyracotherium*, and *Adapis* of the Paris basin

respectively. The former was, however, entirely peculiar in its *Eobasiliidæ*, *Bathmodontidæ*, and *Anchippodontidæ*, and in its almost entire want of artiodactyles (none with crescent-bearing teeth), while the French eocene possessed non-ruminating artiodactyles, with crescent-bearing teeth, in its numerous *Anoplotheriidæ* and *Hyopotamidæ*. He concluded that there were good reasons for regarding the facies as older than that of the Paris basin.

JULY 21.

The President, Dr. RUSCHENBERGER, in the chair.

Nine members present.

Prof. PERSIFOR FRAZER, Jr., made the following remarks: The coal-cutting machine, designed by Mr. Jas. Brown, of Brazil, Ind., and photographs of which were kindly sent me by the inventor, and are herewith offered for the inspection of the members, consists of a steel or iron wheel set in a frame, connected with the pneumatic engine, which runs in rails laid parallel to the face of the heading, which in this case may be several hundred yards long.

On the outer periphery of this wheel are arranged twenty or thirty triangular-shaped pieces of steel, united with it at one of their apices by a pin. In the middle of the opposite side, which is curved, are firmly fixed chilled-steel teeth, which set themselves by friction against the coal to the proper position for cutting, as the wheel is rotated to the right or left. The motion is imparted by means of a small-toothed wheel which moves in rackwork on the under surface of the wheel.

The machine is suitable for the soft coals of jointed structure (*i. e.*, the black coals), and is operated by causing the machine to revolve against the face of an exposure, and at the same time draw itself forward, by means of a rack and pinion attachment, to a middle rail. When it has undercut the coal as far as it can, it is caused to move sideways along the pair of rails first mentioned until it has cut a channel an inch or two high, four and a half feet deep, and as long as the breadth of the heading. The blocks of coal are thus separated from the rest, except on two sides, viz., the upper and the rear sides, and a skilful miner can knock down with the pick huge cubical blocks, which are comparatively regular, and suffer less loss by attrition in transportation.

As in all pneumatic machines the escaped air aids materially in ventilating the mine.

ON SOME BATRACHIA AND NEMATOGNATHI BROUGHT FROM THE UPPER AMAZON BY PROF. ORTON.

BY EDWARD D. COPE.

BATRACHIA.

URODELA.

Oedipus altamazonicus, sp. nov.

Represented by three specimens. These are of slender form with long tail and weak limbs. The digits are palmate to the tips. The head is an elongate oval, and its width enters the length to the groin more than six times. The end of the muzzle is tumid, and notched in the middle; the external nostril pierces each tumidity above the lip. The vomerine teeth are in two short arches meeting in the middle and not extending outwards beyond the inner margin of the inner nares. Parasphenoids numerous, the patches not distinguished anteriorly. Thirteen costal folds, the oppressed foot and thin limbs each extending over four of them. Tail swollen at the base, a vertical oval in section. A groove along the median line of the back and tail. Dermal pores numerous. Color uniform dark brown.

Total length of a small specimen .082 m.: of head and body, .040; of head, .007; width of head behind, .005; length of foot limb, .007. Length of head and body of a larger specimen, .050.

This is the most southern known salamander, the first discovered south of the equator.

From Nauta.

ANURA.

BUFONIFORMIA.

Bufo agua, Daud.

Bufo narieus, Spix.

Bufo margaritifer, Laur. *Orf. Ass. Cur.*

Bufo granulosus, Spix.

From the Marañon.

ARCIFERA.

Phyllomedusa scleroderma, Cope. Proceed. Acad. Nat. Sci., Phila., 1868, p. 112.

From Nauta.

orbiculata, Say, but will at once be distinguished by its somewhat translucent aspect, its umbilicus, and the noticeable lamelliform tooth on the parietal wall. Regarded as belonging in the subgenus *Mesodon*, it will at once be recognized as the most diminutive known member of the group. It is not without importance, inasmuch as it increases the list of rare species referable to *Mesodon* heretofore found in Cherokee Co.,[1] N. C., a portion of which territory forms what is now known as Clay County. The shell can scarcely be confounded with any known species. At the request of Mr. Lea (who refers the shell to me for description) I name the species in honor of Miss Annie E. Law, whose earnest labors in this department of zoology merit a much higher recognition than this.

[1] Helix Clarkii, Lea, Helix Wheatleyi, Bland, Helix Christyi, Bland.

Hyla leucophyllata Beireis, var. *typica* et *triangulum* Gthr.

Nauta.

Osteocephalus planiceps, sp. nov.

A rather slender species, with long limbs, and the general proportions of the species of *Hypsiboas*. Head broad and plane on the upper surface to the straight and rectangular canthus rostralis. Loreal region nearly vertical. The fronto-parietal bones are ossified, and the nasals meet on the middle line; their superior surface is rugose with ossific deposit, which in some cases assumes the form of radiating ridges, but nowhere penetrates the free derm. The lateral margins of the fronto-parietals are indicated by delicate angular ridges incurred posteriorly. The vomerine teeth form two curved transverse series between the posterior portions of the inner nares, the angle forwards the outer limb a little longer. Choanæ very large, *ostia pharyngea* half the size. Tongue oval, bound behind. Eye large with transparent palpebra, its diameter equal to the space between it and the nostril, one-fourth greater than that of the large membranum tympani, and one-fourth less than the frontal width. Belly and sides coarsely areolate, back minutely tubercular. A short tubercular fold from orbit to behind scapula. Fingers free; toes webbed to the base of the penultimate phalange of the fourth digit; first (least) toe webbed to disk. The heel of the extended hind limb extends beyond the muzzle by the diameter of the tympanum. No dermal fringes or processes.

Color above uniform dark brown, concealed surfaces of limbs similar and without any markings. Sides a little varied with the white of the belt. A light border to the upper lip, and lighter line from the orbit to the angle of the mouth; dermal scapular fold pale edged. Femur and tibia with dark crossbands on the exposed surfaces.

	M.
Length of head and body	.060
" " (axial) to angle of mandible	.017
Width " at " "	.019
Length of muzzle from orbit	.009
" of fore limb	.037
" of hand	.016
" of hind limb	.093
" of foot	.037
" of tarsus	.019

Pithecopus tarsius, Cope, loc. cit., p. 113.

Nauta.

Pithecopus cœlestis, sp. nov.

General appearance and size much as in *Phyllomedusa bicolor*, but there is no trace of parotid gland or line of crypts. The pigment of the upper surfaces extends on the humerus and the outer two toes of both limbs. Vomerine teeth present. Palpebræ not reticulate; no dermal processes. Tympanum a vertical oval .3 to .25 of the diameter of the eye. Muzzle short, obliquely truncate to lip. It is reached by the elbow of the extended fore limb; the heel only reaches the front of the orbit. First finger opposable; first toe longer than second; third with very small dilatation. Superior surfaces blue, sides yellow, with vertical purple bars. Concealed surfaces light maroon, with yellow spots; on the posterior face of the femur in two series. Belly and throat sea-green, unspotted. Lower lip yellow bordered; upper lip without markings. Upper eyelids yellow bordered.

Skin smooth above, sides coarsely, belly finely areolate. Forearm and outer toe with a narrow yellow line on the outer margin. A similar one above vent. Length of head and body, .057; of head to angle of jaws, .016; width of head at angle of jaws, .020; length of fore limb, .040; of hind limb, .080; of hind foot, .036; of tarsus, .020.

From Moyabamba, Peru.

Pithecopus tomopternus, Cope, loc. cit., p. 112.

Abundant at Nauta.

Hypsiboas punctatus, Daudin, Dum. Bibr., viii. 552.

Nauta.

Hypsiboas crepitans, Wied. Beitr. Naturg. Braz., i. 525.

From Nauta.

Hypsiboas spectrum, Reinhot. et Lütk. Viden. Medd. Nat. Forening Kjobenhavn, 1861, p. 195.

Very nearly allied to, if not identical with this species. From Nauta.

Centrotelma geographicum, Spix, Cope, Journ Acad., Phila., 1867, 205.

From Nauta.

Hyla marmorata, Daudin, Cope, Proceed. Academy, Phila., 1868, p. 111.

Nauta.

the posterior face of the femur, and one large confluent one on the front of femur and groin, which is on the former notched above by two or three black spots.

	M.
Length of head and body	.044
" of head to angle of jaws	.015
Width " above angle of jaws	.015
Length of hind limb	.070
" " foot	.030
" " tarsus	.012

From Nauta.

The species of this genus may be divided as follows:

Fingers webbed.	*S. vermiculosus.*
Fingers free.	*S. aurantiacus.*
Heel extending to beyond muzzle.	*S. funereus.*
Heel not reaching end of muzzle.	
Skin smooth above.	*S. alleni.*
	S. insignatus.
	S. cryptanthus.
Skin arrolate above.	*S. ruber.*
	S. acuminatus.

Scytopis amantiacus, Daudin.

Nauta.

Nototrema marsupiatum, Derm. Bibr. Exp. Gen. viii. 598.

Nauta: in two specimens, the ethmoid is unossified above, while there is no fronto-parietal fontanelle.

Family CYSTIGNATHIDÆ.

Subfamily CYSTIGNATHI.

Bubonias plicifrons, gen. et sp. nov.

Fronto-parietal bones fully ossified, nasals separated. Xiphisternum, an osseous style with disk. Auditory organs well developed. A large gland in the inguinal region; no tarsal shovels nor spurs. Maxillary, but no vomerine teeth. Form, toad-like.

This genus it is evident presents characters of *Liuperus* in dentition, *Pleurodema* in glands and feet, and *Cystignathus* in cranial structure.

Char. Specif.—Head narrow, with elevated lores. Membranum tympani oval, its long axis directed upwards and forwards, and nearly equal in length to that of the eye. The latter equals the length from its border to the end of the (osseous) muzzle. Skin

This is the fourth species of the genus *Osteocephalus*, Fitz, and differs from those previously known in the absence of palmation of the fingers, weaker cranial crests, straight canthus rostralis, etc.

From Nauta.

Scytopis funereus, sp. nov.

Vomerine teeth in short fascienti between the choanæ. Fingers free. Head oval, muzzle narrowed; eyes small, diameter equal length to muzzle and less than frontal width, twice diameter of tympanic membrane. Hind limbs long, the heel extending to considerably beyond the end of the muzzle. First (inner) toe nearly free; longest webbed to base of penultimate phalange. Areolation of belly fine, back with a very few scattered elevations. Dark brown or blackish with a broad black cross-band between the eyes and several across arm, femur, tibia, and tarsus. Femora uniform behind; a few black spots on the posterior part of the side. Throat and breast black punctated.

	M.
Length of head to angle of lower jaw	.012
" of head at angle of lower jaw	.015
" to vent	.044
Width of sacrum	.008
Length of hind leg	.073
" " foot	.030
" " tarsus	.013

Distinguished from other species of the genus by its long legs.

From Moyabamba, Peru.

Scytopis allenii, Cope, Proceed. Amer. Philos. Soc. 1869, p. 162.

From Nauta and Moyabamba.

Scytopis cryptanthus, sp. nov.

Allied to the last species, but with non-elongate flat head, and different coloration. The head is a long oval, and the diameter of the eye is only three-fifths the length from its border to the external nostril, about .75 the interorbital width, and one and one-half times that of the membranum tympani. Vomerine teeth between nares. The heel of the extended hind limb marks the half the distance from orbit to end of muzzle. Fingers and first toe free. Uniform dark brown above, sides and gular region brown speckled. Groin and concealed surfaces of hind limbs black, with brillant yellow spots, three on the under side of the tibia, two on

the posterior face of the femur, and one large confluent one on the front of femur and groin, which is on the former notched above by two or three black spots.

	M.
Length of head and body	.044
" of head to angle of jaws	.015
Width " above angle of jaws	.015
Length of hind limb	.070
" " foot	.030
" " tarsus	.012

From Nauta.

The species of this genus may be divided as follows:

Fingers webbed.	*S. venulosus.*
Fingers free.	*S. aurantiacus.*
Heel extending to beyond muzzle.	*S. funereus.*
Heel not reaching end of muzzle.	
Skin smooth above.	*S. allenii.*
	S. xsignatus.
	S. cryptanthus.
Skin arrolate above.	*S. ruber.*
	S. acuminatus.

Scytopis amantiacus, Daudin.

Nauta.

Nototrema marsupiatum, Derm. Bibr. Evp. Gen. viii. 598.

Nauta; in two specimens, the ethmoid is unossified above, while there is no fronto-parietal fontanelle.

Family CYSTIGNATHIDÆ.

Subfamily CYSTIGNATHI.

Bubonias plicifrons, gen. et sp. nov.

Fronto-parietal bones fully ossified, nasals separated. Xiphisternum, an osseous style with disk. Auditory organs well developed. A large gland in the inguinal region; no tarsal shovels nor spurs. Maxillary, but no vomerine teeth. Form, toad-like.

This genus it is evident presents characters of *Liuperus* in dentition, *Pleurodema* in glands and feet, and *Cystignathus* in cranial structure.

Char. Specif.—Head narrow, with elevated lores. Membranum tympani oval, its long axis directed upwards and forwards, and nearly equal in length to that of the eye. The latter equals the length from its border to the end of the (osseous) muzzle. Skin

everywhere smooth except in the following regions of the upper surface. A strong elevated fold from the superciliary border to the inguinal gland, below which on the scapular region is a boss like a parotid gland: A fold from the inner border of the eyelid to the end of the sacral diapophysis; a fold from the end of the muzzle to the end of the coccyx on the median line. A short conic tubercle stands at its extremity on the muzzle. Edge of the eyebrow with three dermal processes or "horns." There is a ridge extending along the inner border of the large choanæ which supports no teeth. Tongue a long oval, notched posteriorly. The middle of the forearm marks the end of the muzzle, and the heel, the tympanum. Digits all entirely free.

Color above brown; below pure white; sides pure black, the color extending on the sides of the abdomen and then passing round in front of the femora, thus inclosing an anchor-shaped space of white. A black spot on the posterior part of the inguinal gland; femora behind with a black band from one popliteal region to the other. From this, black bands extend to the end of the coccyx, one across the femur above, and a broad one across the femur below, near the knee. Tibia below black, with a yellow cross-band. Limbs above brown; forelegs black and white spotted below.

	M.
Length of head and body	.038
" " to angles of mandible	.013
Width " at " "	.012
Length of fore limb	.021
" of hind limb	.045
" of hind foot	.022
" of tarsus	.008

Two specimens from Nauta.

The dermal plicæ though strong are easily lost by stretching.

Cyclorhamphus æmaricus, sp. nov.

Form like *Scaphiopus*. The tympanic membrane wanting and the tympanic chamber occupied by muscle. Ostia pharyngea minute; their depth not ascertained. Vomerine fasciculi minute, and between the small choanæ. Tongue round, extensively free. Labial integument largely free and overhanging the lower jaw. Xiphisternum broad, emarginate base osseous. Limbs short, the heel reaches about to the angle of the mouth. Fingers free, toes

half palmate; a free border on the inner side of the tarsus, and outer side of outer toe. Skin smooth except a few small tubercles on the occipital region. In the male there are numerous small horny points on the breast, and a large horny plate on each thumb, whose surface is roughened with crowded projecting points.

Color olive-brown above, lighter brown below; one specimen has a few scattered yellow spots above.

	M.
Length of head and body	.048
" of head to angle of mandible	.012
Width " at " "	.018
" " interorbital	.004
Length of fore limb	.025
" of hind limb	.068
" of hind foot	.032
" of tarsus	.012

Two specimens from lake Titicaca.

This species has a much less depressed head than the *C. marmoratus*, and probably a less developed auditory apparatus, and vomerine tooth series. The coloration is entirely different. The *C. fasciatus*, Peters, is equally distinct, judging from the description.

Hylodes sulcatus, sp. nov.

Distinguished for its very wide head and rugose skin. The form is stout, but the hind limbs rather elongate. The maxillary borders are so expanded as to give the tympanic disks a partly vertical exposure. These are vertically oval, the diameter a little less than that of the orbit. The latter is a little less than the length to the anterior nares. Choanæ large, but little larger than the ostia pharyngea. Vomerine teeth in two short curved series entirely behind the choanæ, and not extending outwards beyond their middle; they approach nearly inwards. Tongue round, entire, one-third free. Fingers very short without expansions. Heel of extended hind limb to nares; expansions of hind toes well marked, with T-shaped phalanges. A peculiarity of the species is seen in the strong ridge that extends along the superciliary border to the posterior border of the cranium, inclosing a groove with its fellow. Skin below areolate on the belly; above with numerous short, generally symmetrical folds, two of which cross the suprascapular region, two on the sides, two on each side the back, etc. The

sides of the head from the orbit to the angle of the jaws is covered with closely placed tubercles giving a rugose surface.

Color, deep brown above, white below. Limbs crossbarred with brown; femora pale, marbled behind. Lips without light border; a pale spot below the interval between orbit and tympanum.

	M.
Length of head and body	.047
" of head to angle of jaws	.016
Width of head at angle of jaws	.025
" of head at interorbital	.004
Length of fore limb	.024
" of hind limb	.075
" of foot	.034
" of tarsus	.014

From Nauta. Evidently allied to the *Strabomantis biporcatus*, Peters.

Lithodytes conspicillatus, Gthr. Batrach, Brit. Mus., 92, Var.

"Santarem, Brazil, No. 141."

Plectomantis rhodostima, sp. nov.

General form ranoid, with oval head and full and truncate muzzle. The head of the extended hind limb reaches to the posterior border of the orbit. Tympanum .66 the size of the eye, which equals in terorbital width and length to nostril. Vomerine teeth, in two short curved series, on a transverse line behind the nares, and extending upwards as far as their inner border. Their size a little exceeds that of the ostia pharyngea. Tongue elongate oval, largely free. Skin smooth above and below. Toes before and behind, with well-marked dilatations, and without dermal margins. Color, above uniform brown, below whitish; muzzle blackish to the orbits; femora dark-brown behind. A rose-colored spot in the groin, one on the superior face of the femur, two on the inferior face of the tibia, and one on the superior face of the tarsus.

	M.
Length of head and body	.045
" of head to angle of jaws	.014
Width of head at angle of jaws	.015
" of head between orbits	.004
Length of fore limb	.026
" of hind limb	.059
" of hind foot	.029
" of tarsus	.012

and meeting its fellow at the pubis. No spots or bands on the upper surfaces.

	M
Length of head and body	.026
" of head to angles of jaws	.010
Width of head at angle of jaws	.008
Length of fore limb	.015
" of hind limb	.035
of hind foot	.017

From Nauta.

Dendrobates speciosus, Schmidt, Denkschr. Acad. Wiss. Wien, 1858, p. 249.

From

Atelopus seminiferus, sp. nov.

Body elongate, limbs rather short; the muzzle nearly reaching the middle of the extended forearm, and the heel marking the scapula. The muzzle viewed from above is rounded, truncate, and in profile somewhat prominent; the nostril marking a line which falls behind the symphysis of the mandible. The eyelid is thickened, and is not prominent; and the diameter of the eye equals the length of the muzzle and the posterior interorbital width. The ethmoid appears to be ossified to the end of the muzzle. Fingers slightly, toes largely webbed, the web reaching the end of the first phalange of the fourth (long) toe. Tongue narrow, extensively free; ostia pharyngea smaller than the small choanæ. Skin smooth except on the sides, where there are numerous closely-placed minute tubercles from the head to the groin. A broad fold of skin extending from the side to the middle of the length of the femur.

Above, dark-brown; below, brownish-orange. Sides black from head to groin; each tubercle of the skin yellow, resembling yellow grains. Limbs uniform black.

	M.
Length of head and body	.040
" of head to angle of jaws	.009
Width of head at angle of jaws	.009
Length of fore limbs	.026
" of hind limbs	.045
" of hind foot	.021
" of tarsus	.007

From between Balsa Puerto and Moyabamba, Peru.

This species has a much shorter muzzle and limbs than the *A. spumarius* (Proceed. Acad. Philada., 1871, p. 222); from Pebas.

Color, above reddish to brown, in one specimen bright-red; femora black behind, faintly pale-marbled; front of femur black, a few black spots in the groin. Entire hind limb black, cross-barred. A narrow black bar from nostril to tympanum; upper lip broadly black-bordered. Inferior surfaces dark-brown, with numerous pale dots, which may be wanting on the gular region, and inosculate on the femur.

	M.
Length of head and body	.066
" of head to angle of jaws	.019
Width of head at angle of jaws	.026
" of head between orbits	.006
Length of fore limb	.035
" of hind limb	.081
" of hind foot	.040
" of tarsus	.016

From Moyabamba, Peru.

Dendrobates trivittatus, Spix (?).

This species agrees with the figure given by Spix, and differs from the description by Günther, of the *D. tinctorius*, to which the latter author refers it as a synonym. Thus the dorsal derm is closely areolate, and the ventral smooth, and the first finger is longer than the second. There are three longitudinal yellow bands, the outer springing from the orbits, the median from between them. The lateral extend to the knee, while another band extends from the lips below the orbit to the middle of the humerus. A yellow horse-shoe on the end of the muzzle; below black, with yellow spots on the limbs only. Femur with few spots behind.

From between Balso Puerto and Moyabamba, Peru.

Dendrobates labialis, sp. nov.

Skin minutely areolate on the upper surfaces, smooth below. Muzzle flat, moderately elongate, and broadly truncate. Tympanum one-fifth size of eye, which equals length of muzzle and interorbital width. The muzzle marks the end of the forearm, and the posterior edge of the orbit the heel. First finger longer than the second. The upper surfaces are colored by some pigment, whose distinctive character has been lost in the alcohol. Upper lip pale banded, the band extending through the axilla,

and meeting its fellow at the pubis. No spots or bands on the upper surfaces.

	M.
Length of head and body	.026
" of head to angles of jaws	.010
Width of head at angle of jaws	.008
Length of fore limb	.015
" of hind limb	.035
of hind foot	.017

From Nauta.

Dendrobates speciosus, Schmidt, Denkschr. Acad. Wiss. Wien, 1858, p. 249.

From

Atelopus seminiferus, sp. nov.

Body elongate, limbs rather short; the muzzle nearly reaching the middle of the extended forearm, and the heel marking the scapula. The muzzle viewed from above is rounded, truncate, and in profile somewhat prominent; the nostril marking a line which falls behind the symphysis of the mandible. The eyelid is thickened, and is not prominent; and the diameter of the eye equals the length of the muzzle and the posterior interorbital width. The ethmoid appears to be ossified to the end of the muzzle. Fingers slightly, toes largely webbed, the web reaching the end of the first phalange of the fourth (long) toe. Tongue narrow, extensively free; ostia pharyngea smaller than the small choanæ. Skin smooth except on the sides, where there are numerous closely-placed minute tubercles from the head to the groin. A broad fold of skin extending from the side to the middle of the length of the femur.

Above, dark-brown; below, brownish-orange. Sides black from head to groin; each tubercle of the skin yellow, resembling yellow grains. Limbs uniform black.

	M.
Length of head and body	.040
" of head to angle of jaws	.009
Width of head at angle of jaws	.009
Length of fore limbs	.026
" of hind limbs	.045
" of hind foot	.021
" of tarsus	.007

From between Balsa Puerto and Moyabamba, Peru.

This species has a much shorter muzzle and limbs than the *A. spumarius* (Proceed. Acad. Philada., 1871, p. 222); from Pebas.

Colostethus latinosus, Cope (?), Proceed. Academy, Philada., 1866, 130, and 1863, 48. Colors not presented; identification not final.

Between Balsa Puerto and Moyabamba.

RANIFORMIA.

Ranula brevipalmata, sp. nov.

Nearly allied to the *R. affinis*, but with the web of the posterior digits only reaching the bases of the ultimate, or in the fourth toe, the penultimate phalange. The membranum tympani is as large as the eye (not orbit); and the nostril is near the end of the muzzle. The extended hind limb brings the heel to the anterior border of the orbit, instead of the end of the muzzle, as in *R. affinis*. General color, olive; below, white. Femora and tibiæ marbled, with black behind.

	M.
Length of head and body	.049
" of head to angle of jaws	.020
Width of head at angle of jaws	.019
" of head between orbits	.005
Length of fore limb	.027
" of hind limb	.074
" of hind foot	.034
" of tarsus	.012

From Nauta.

Ranula nigrilatus, sp. nov.

Toes fully palmate to ends of last phalanges, or base of same on the fourth digit. Heel of extended hind limb reaching anterior border of orbit. Eye one and a half times the diameter of the tympanum, and equal to the length of the lores to the nostril. Muzzle truncate in marking the middle of the metacarpi of profile; flat above the extended fore limb. First and second fingers equal; a tarsal dermal fold. Skin smooth.

Color, dark-brown; sides black; lower surfaces closely marbled with dark-brown. Femora and tibiæ black, marbled behind.

	M.
Length of head and body	.048
" of head to angle of jaws	.018
Width of head to angle of jaws	.018
Length of fore limb	.025
" of hind limb	.070
" of hind foot	.034
" of tarsus	.012

This species has the palmation of *R. affinis*, and the short legs of *R. brevipalmata;* the tympanum is smaller than in either. The head is longer and the femur shorter than in the latter. The coloration is notably distinct. In neither of these species do I find the dorsolateral dermal fold of the *R. affinis*, though this may be due to the rather soft state of the specimens.

From Nauta.

NEMATOGNATHI.

Trichomycterus pardus, sp. nov.

Origin of dorsal fin but little behind a point above that of the ventrals. Radii, D. 8; A. 6; V. 5; A. 12; truncate. Head flat, entering the length without caudal fin 4.8 times. Diameter of orbit one-sixth length of head, and one-half interorbital breadth. Nareal beard extending backwards beyond eye, and the maxillary to the border of the suboperculum. Preopercular and opercular patches full. Color above yellowish-brown, with three rows of dark-brown spots on the sides. Fins and lower surfaces pale and unspotted. Total length, .073; caudal fin, .011; head, .010; depth at dorsal fin, .011.

This is one of the few species of the genus where the dorsal fin is nearly immediately above the ventrals.

From

Trichomycterus rivulatus, Cud., vol. xviii. 495.

From Arequipa, Peru.

Bunocephalus melas, sp. nov.

Radial formula: D. 5; P. I. 5; V. 6; A. 7; C. 10. Head and shield are elongate oval, without prominent ridges or marginal angles. The anterior humeral tuberosity marks one-third the length to the middle of the shield at the basis of the dorsal ray. The width in front of the pectoral spine is a little less than .25 of the total length (including caudal fin); the length of the post-coracoid process is equal to nearly two-thirds of the interspace between them. The maxillary barbel extends to the end of the basal third of the pectoral spine; the latter oppressed, reaches the base of the ventral fins. Tail at anal fin wider than deep; compressed near the base of the caudal fin. Four rows of wartlets on the sides, one of them on the lateral angle of the tail. Dorsal fin nearer the end of the muzzle than the base of the caudal fin by two-thirds the length of its base.

Color black, darkest on the sides; head speckled with paler. Total length .072; to caudal fin, .059; to dorsal fin, .028; to dorsal shield, .025; to line of anterior humeral tuberosity, .008; to orbit, .003.

From Nauta. The dorsal fin is apparently more posterior than in *B. gronovii*, and there are fewer anal rays than in *B. aleuropsis*.

Dysichthys coracoideus, gen. et sp. nov.

Char. Gen.—In general similar to *Bunocephalus*, but there are no mandibular nor mental barbels. The head is depressed, but deeper than the narrow tail.

Char. Specif.—Radial formula, D. 5; A. 7; C. 10; V. 6; P. I. 4. Dorsal fin bound to the back behind by its membrane, the base of its first ray a little nearer the end of the muzzle than the basis of the caudal fin. The head and neck shield is diamond-shaped, with truncate angles, and the humeral angles mark the middle of its length instead of an anterior point, as in *Bunocephalus nelas*. The anterior humeral tuberosity marks one-third the length from the end of the muzzle to the second dorsal ray, measured axially. The shield is peculiar for its strong ridges and scalloped borders. A high heel, with three prominences, divides it behind, while the scutum supports another. The posterior border presents two angles, and there is a ridge across behind the orbits. A ridge from each orbit meets its fellow, forming a V at the occiput, and a ridge from the humeral process meets its fellow behind this point. The postcoracoids are longer than in *B. melas*, their length equalling the width between them. The pectoral spines extend beyond the base of the dentrals. The maxillary barbels extend to the base of the pectoral spines. The tail is quadrangular with a line of evantlets along the lateral angle. Belly, tail, and fins, black; throat and belly white speckled. Shield brown, with some paler specks. Total length, .055; do. to caudal fin, .046; do. to dorsal, .021; do. to dorsal scutum, .018; do. to humeral tuberosity, .010; do. to orbit, .003.

Several specimens from Nauta.

Zathorax nauticus, sp. nov.

Coracoid portion of the scapular arch only ossified so as to occupy the derm. Postcoracoid narrow, not excavated. A distinct adipose fin. Prefrontal bone acutely pectinate on its upper face. Head (to end of casque) one-third length to middle of caudal

fin. Orbit one-third length of head (to gill opening), and nearly equal interorbital width. Mandibular barbel to end of postcoracoid process; maxillary to end of pectoral spine. Width of casque greater than the interorbital. Radii D. L. 6; A. 12; V. 7; P. I. 4. Dorsal spine grooved, not dentate; pectoral spine strongly toothed extending beyond basis of ventral fin. Postclavicle with recurved teeth; caudal fin truncate. Lateral shields 26 low, leaving a broad naked band above and below them; with a single strong median curved spine. Color brown above, with a yellow band along the middle of the side border red with black above and below. Belly white; below the pectoral fin purple. Caudal fin with some vertical dark bars. Total length, .082; do. to first anal ray, .045; do. to end of postcoracoid, .026; do. to base of dorsal fin, .026; do. to gill opening, .016; do. to orbit, .004.

From Nauta. The less exposure of the scapular arch below, simple postcoracoid, etc., distinguish this fish from the *Z. monitor*, m. According to the description of Dr. Günther the *Doras asterifrons* pertains to the genus *Zathorax*.

Rhinodoras niger, Valenciennes; Gthr. v. 209.

Nauta.

One of the specimens is twenty-five inches in length.

Rhinodoras prianomus, sp. nov.

Head long, extending (measured to the end of the opercular flap) the length of the short body to the origin of the upper and lower caudal radii, 2.5 times. The eye is one-seventh the length of the head, and is equidistant between the end of the muzzle and the edge of the operculum, and is half the interorbital width. Lateral scuta 22; the first and last with rudimental spine; that of the others strong and curved, the upper edge of the scutum with two or three prickles. The scuta leave a wide naked space above and below them. Radii, D. I. 6; A. 10; V. 7; P. I. 10. Dorsal and pectoral spines serrate to the base on their anterior edges; postclavicle with a longitudinal angle, which supports a series of processes and spines. Head and casque rugose above. Maxillary barbels reach to beyond eye; the outer mentals are .66 as long. Color brown, paler below, with numerous vertical dark brown spots on the sides. All the rayed fins, and the back at the base of the adipose, black. Head above and at sides gray

with numerous large brown spots. Length to base of caudal fin (marginal) m. .12; to base of dorsal, .07.

From Nauta.

One of the specimens from Nauta measures twenty-five inches.

Corydoras ambiacus, Cope, Proceed. Acad. Phila., 1872, p. 280.

From Nauta.

Corydoras armatus, *Calichthys armatus.* Günth. Proceed. Zool. Soc. Lond., 1868, p. 231.

Callichthys asper, Quoy. Gaim.

Nauta.

Hoplosternum longifilis, Cuv. Val., Günther, v. p. 228.

Nauta.

Hypoptoporna bilobatum, Cope, Proceed. Amer. Philoso. Soc., 187.

Loricaria cataphracta, L. Günther, v. p. 255.

From the Marañon.

Loricaria rostrata, Spix, Günther, v. 256.

Liposarcus jeanesianus, sp. nov.

This large and handsome species is allied to the *L. pardalis*, Cast, and *L. varius*, Cope, but presents a number of peculiar features. It is elongate and depressed, the head moderately so only. The head enters the total length (with caudal) 5.75 times; while the greatest depth (in front of the dorsal fin) enters it eight times, the head being measured to the superior end of the branchial fissure. There is an obtuse canthus rostralis from the orbit to the nares, there is a strong nuchal angle (not a crest), and a low one corresponding to the outer border of the epiotic bone. The two nuchal scuta have two very low ridges each. The orbit is small, entering the length of the snout 6.5 times, and the interorbital width 3.25 times. The sculpture of the upper surfaces of the head consists of numerous close grooves forming various patterns. Two or three small spines on the interoperculum. Beard reaching the line of the front margin of the eye. Inferior surfaces to anal fin entirely granular. Scuta of the body in twenty-eight transverse and (at the dorsal fin) four longitudinal series. They have a low serrate keel which ends in a point. Six scuta between dorsal fins and fourteen between anal caudal. Radii D. II. 12; C. I. 14, I; A. I. 4; V. I. 5; P. I. 6. Base of the dorsal enters total length 3.5 times, and equals the length of the head and nape

in front of it, exceeding the length of the pectoral spines by two interradial spaces.

Color olivaceous above with numerous black spots, which inosculate on the dorsal region; below lighter with numerous closely placed black spots. Fins clouded. Head very closely radiate, banded and spotted.

Total length .400 m. (15.75 inches); length to bases of caudal, .305; do. to anal, .200; do. to ventral, .140; do. to pectoral, .060; do. to edge of inferior lip, .034; do. to superior teeth, .011. Length of first dorsal spine, .071; humeral width, .077.

Two specimens from Nauta, Peru. Dedicated to Joseph Jeanes, of Philadelphia, one of the most liberal patrons of students of the Natural Sciences in the United States.

Liposarcus scrophus, sp. nov.

Size of the last species but much more robust and rough in character. The dorsal outlines arched, rising abruptly in a strong crest on the posterior cephalic scutum, and maintained by the rough lateral keels of the nuchal plates. The head enters the total length 4.25 times, and the greatest depth the same, five times. An obtuse ridge to nares and a low swelling on the upper part of the pterotic shield. There is an angular tuberosity on the upper posterior part of the orbit, and a low ridge on the inner side of each of the nares. Barbel only extending to line of interior nostril. Several strong spines on the interoperculum. Diameter entering length of side of muzzle four times, and three and a quarter times the interorbital width. Sculpture of the upper surfaces of the head consisting of lines of minute acute tubercles, which are nearly obsolete on the interorbital.

Lower surfaces everywhere rugose. Scuta in twenty-seven transverse, and four longitudinal series, all rugose with lines of points and each with an elevated keel-brush of small spines. The upper and lower series of lateral scuta are strongly angulate, and the sides are swollen from opposite the base of the dorsal fin. Five scuta between the dorsal fins and thirteen between the anal and caudal fins. Radii of fins; D. II. 12; C. I. 14, I; A. I. 4; V. I. 5; P. I. 6. Dorsal fin longer than high, entering total length 3.5 times and a little less than length in front of its first spine. Length of latter equal length of head to end of interoperculum. Pectoral fin stout, shorter than basis of dorsal fin by three interspaces. The lower caudal lobe is, as in *L. jeanesianus* consider-

ably longer than the upper. Color uniform black; upper caudal ray yellowish.

	M.
Total length	0.370
Length to basis of caudal fin	.298
" " " of oval fin	.200
" " " of ventral	.145
" " " of pectoral	.070
" " " of edge of lower lip	.040
" to superior teeth	.014
" to first dorsal spine	.075
Humeral width	.093

Two specimens from Nauta.

Plecostomus virescens, sp. nov.

Head wide, depressed, muzzle moderately elongate; body and tail rather elongate. There is a very obtuse occipital and nuchal elevation, while the post and preorbital angles are well marked. A few preopercular spines. Head below naked behind the mouth. Teeth numerous, acutely incurved. Posterior lip entire, smooth; beard shorter than diameter of orbit. The latter is one-fourth the length of the head, and one-half the flat interorbital space. Length of head 4.25 times in the total minus caudal fin. Radii D. I. 7, I; C. I. 14, I; A. 5; V. I. 4; P. I. 6. Basis of dorsal equal space between it and second dorsal plus one scutum, and equal the length in front of it to the middle of the interorbital region. Pectoral spine reaching a little beyond base of ventral. Scuta 26—4, without keels but with numerous rugose ridges.

AUGUST 4.

The President, Dr. RUSCHENBERGER, in the chair.

Six members present.

Dimorphism in the Leaves of Acer Pennsylvanicum, Lin.—Mr. THOMAS MEEHAN exhibited some branches of Acer Pennsylvanicum, Lin. (*A. striatum*, Lamb), which had a remarkable system of dimorphic foliage, and which he believed had been generally overlooked.

The first pair of leaves developed after the bursting of the bud in the spring, were larger and more perfectly developed than any subsequent ones. In his specimens they were about six inches long and five wide, and strongly three-lobed towards the apex. The next pair, however, were usually lance linear, in the specimens exhibited about five inches long and less than two wide. Occasionally there was a tendency to the production of a pair of lobes, but usually the margins were entire or sparsely serulated. The third and subsequent pairs of leaves partook of the form of the first pair, though seldom so large. He had examined several hundred of young trees, and all had this singular dimorphic condition, the second pair in all cases having this peculiar narrow form.

It was worthy of remark that in plants with alternate leaves, the leaves with their axial buds were generally about the same size. In some few instances there were variations in the size, especially in the one-third arrangement of the leaves on the stem. In opposite leaved plants the rule was the other way; one bud or one leaf, either in the blade or petiole, being larger or longer than the other. In the maples this was especially the case. At times the petioles in some cases would be not more than half the length opposite. He had found this especial peculiarity, however, in no other species but *A. Pennsylvanicum* that he had been able to examine, which included most in common cultivation. It might be in *A. spicatum*, Lam., which he had not been able to examine this season, and which he supposed to be but a variety of *A. Pennsylvanicum*.

AUGUST 11.

The President, Dr. RUSCHENBERGER, in the chair.

Seven members present.

AUGUST 18.

The President, Dr. RUSCHENBERGER, in the chair.

Fourteen members present.

AUGUST 25.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty members present.

On Pectinatella magnifica.—Prof. LEIDY exhibited a living specimen of the fresh-water ciliated polyp, formerly described by him under the name of Pectinatella magnifica. It was obtained by him this morning from the mill-pond at Kirkwood, N. J., on the Camden and Atlantic R. R. The specimen, about four inches square and three inches thick, is a fragment of a large colony, which enveloped the submerged trunk of a tree. The entire colony was estimated to be about six feet long, and from six to twelve inches in diameter, including that of the tree trunk, which was about four inches. Several branches of the tree were also invested with extensions of the colony from six inches to a foot in length. Pectinatella is by far the largest of all the known fresh-water ciliated polyps, and, indeed, is not surpassed by any of the marine forms known to us. It has not been determined whether the huge Pectinatella colonies start each from a single individual, or are the result of the confluence of a number of small colonies. On the approach of winter the colonies die and undergo decomposition, in which process the remarkable winter eggs or statoblasts are liberated. These are provided with anchor-like spines, by which, as in the case of the eggs of skates and sharks, they become attached to various fixed bodies.

On a Parasitic Worm of the House-fly.—Prof. LEIDY remarked that since it had become well known that many parasitic worms passed different stages of development within several different animals, he had from time to time sought for the sources from whence the more common thread worms obtained entrance into the human body, but thus far without success. The *Trichina spiralis*, discovered in man in 1833 by Mr. Hilton, and described and named by Prof. Owen in 1835, was first found in the hog by Prof. Leidy in 1846 (See Proc. A. N. S., iii. 108), but it was not until some years subsequently that it was determined that man and the hog acted reciprocally as hosts for the Trichina in its different stages of development.

In examining various common animals of our household, Prof. Leidy had found a thread worm, infesting the common house-fly. The worm is from a line to the tenth of an inch long, and lives in the proboscis of the fly. It was found in numbers from one to three in about one fly in five. The parasite was first discovered in the house-fly of India, by the English naturalist, Mr. H. J. Carter, who described it under the name of *Filaria Musca*, and suggested the opinion that it might be the source of the Guinea worm, *Filaria Medinensis* in man. Mr. Carter states that he found from two to twenty of the worms in one fly of three. Dr. Diesing referred the parasite to a new genus with the name of *Habronema Muscæ*. The singular position in which the worm lives suggests the many unsuspected places we have to search to find the parents or offspring of our own parasites.

Notice of some Fresh Water Infusoria.—Prof. LEIDY remarked that a species of Limnias, belonging to the order of wheel animalcules, or Rotatoria, was exceedingly abundant in our rivers. It lives in a tube, of its own construction, attached to aquatic plants and stones. He had not been able to determine whether it was a different species from the *L. ceratophylli* of Europe. The latter is described as solitary, but the common Limnias of our rivers is remarkable for the dense bunches that it forms. In many localities of the Schuylkill almost every stone exhibits multitudes of such bunches, pendent from the sides and under part. The bunches are conical, and usually one tube serves as a pedicle, while the others hang from it and often curve outwardly. From two or three to as many as fifty tubes may be counted in a bunch. This fasciculated character may distinguish the animalcule as a variety, which might be named *L. socialis*.

The bunches of Limnias form a support for a multitude of other animalcules. Among the latter, *Cothurnia pusilla* is quite common. Prof. Leidy had also observed upon the bunches on several occasions the curious branching infusorium described by Ehrenberg, and also described and figured by Claparede under the name of *Dendrosoma radians*. This measures a half a line or more in length, and terminates in branchlets, each with a rounded end, from which project a multitude of delicate rays, extending as much as the one-twelfth of a line in length.

SEPTEMBER 1.

The President, Dr. RUSCHENBERGER, in the chair.

Fifteen members present.

Dr. NOLAN, having announced the death of Dr. JOHN HAMILTON SLACK, made the following remarks:—

Dr. Slack was born September 23d, 1834. After graduating from the Department of Arts of the University of Pennsylvania, he made a tour of Europe, Northern Africa, and the Nile, and was elected a member of the Academy in July, 1857. During the same year he presented valuable specimens of Egyptian natural history and antiquities, for which the thanks of the Academy were formally returned. The next year he presented for publication a paper, which appeared in the Proceedings under the title "Catalogue and Notes on the Egyptian Antiquities in the Museum of the Academy." In the spring of 1859 he graduated from the Medical Department of the University, and at once applied himself to the practice of his profession and the study of natural history. From this time until his removal from the city he was an active and enthusiastic worker in the Academy. His name appears in the Proceedings as a constant contributor to the museum and library, and also as the author of three papers on Mammalogy, the most important of which was a monograph of the Prehensile-tailed Quadrumana of South America. The work, however, by which he will be longest remembered as a member of the Society is his Handbook to the Museum, the first edition of which appeared in 1861 and was rapidly exhausted. A second edition was immediately issued, and of this, also, several thousand copies were sold, showing that the Handbook supplied a want long felt, and which, in consequence of the partial rearrangement of the collections, again exists.

Dr. Slack was elected Librarian of the College of Physicians in December, 1864, and served until December 31, 1867. He removed from the city in 1868 to his estate in Warren County, New Jersey, which he named Troutdale, and where he resided until his death, on August 24, 1874, actively engaged in pisciculture. So highly was his work in this field appreciated that he was appointed one of the Fish Commissioners of New Jersey. He also rendered important service as Assistant United States Fish Commissioner under Prof. Baird, during the winter of 1873–74, in hatching nearly half a million eggs of the *Salmo quinnat* received from California, and in distributing the fry to various rivers of the Middle and Southern States. His contributions to the literature of practical fish culture during this time were numerous and valuable.

Dr. Slack was a gentleman of unusually varied attainments. Although he was most devoted to the natural sciences, he exhibited an active interest in literature and art. He possessed talents as a musical composer which, if cultivated, would have secured him a wide-spread reputation. As it is, his arrangement of Home, Sweet Home has rendered his name familiar to thousands who know nothing about his life-work. He extended hearty sympathy and valuable assistance to those who took an interest in the pursuits to which he was devoted; and these, as well as more advanced

students of natural history, who recognized in him a valued associate, will hear of his death with unfeigned sorrow.

SEPTEMBER 8.

The President, Dr. RUSCHENBERGER, in the chair.

Fourteen members present.

The following papers were presented for publication:—

"Notes on Santa Fé Marls and some of the Contained Vertebrate Fossils." By E. D. Cope.

"On a new Variety of Helix." By James Lewis, M.D.

Notice of a Remarkable Amœba.—Prof. LEIDY stated that in the early part of last June, in examining some material obtained from a mill-pond at Absecom, New Jersey, he had observed a most wonderful amœboid animal, of which he had made notes, but was not able at the time to make a drawing and satisfactory description. Subsequently he sought patiently for two days in the same material for another individual, but without success. Last week he made a visit to the Absecom mill-pond to seek the curious amœboid, and was so fortunate as to find it again. Prof. Leidy exhibited a drawing of the animal, and described it as follows:—

The animal at rest is spherical or oval, or constricted back of the middle. In the spherical form it measured the one-fifth of a millimetre in diameter; in the oval and constricted form it was about one-fourth of a millimetre long, and one-sixth of a millimetre broad. It is white or cream colored, opaque, or translucent at the border, and was spotted green from food balls of desmids. It moves with extreme sluggishness, and with little change of form. From the fore part of the body the animal was observed to project almost simultaneously a number of long, conical, acute pseudopods, about the one-twelfth of a millimetre long. From the back part in the same manner a multitude of papillaform pseudopods were projected about the one-fiftieth of a millimetre long. All the pseudopods and the surface of the body everywhere bristled with innumerable minute spicules. From time to time more or less obtuse portions of the clear ectosare were projected, and these likewise were observed to be covered with the minute spicules. The opacity of the animal prevented the exhibition of a nucleus, if such exists.

In general appearance the curious creature resembles one of the forms of *Pelomyxa palustris*, described by Prof. Greef, in Schultze's *Archiv*, vol. x. pl. iv., fig. 9, but in this, minute spicules project only from the posterior disk-like extremity of the body, as they have also been observed to do in the corresponding part of *Amœba villosa*, of Wallich, and perhaps other species.

The general spiculate character of the Absecom amœboid is

probably sufficient to distinguish the animal generically from Amœba, and in this view the animal may be named *Deinamœba mirabilis.*

On the Mode in which Amœba swallows its Food.—Prof. LEIDY remarked that he had supposed that Amœba swallows food by this becoming adherent to the body, and then enveloped much as insects become caught and involved in syrup or other viscid substances. He had repeatedly observed a large Amœba, which he supposes to be *A. princeps*, creep into the interstices of a mass of mud and appear on the other side without a particle adherent. On one occasion he had accidentally noticed an Amœba, with an active flagellate infusorium, a Urocentrum, included between two of its finger-like pseudopods. It so happened that the ends of these were in contact with a confervous filament, and the glasses above and below, between which the Amœba was examined, effectually prevented the Urocentrum from escaping. The condition of imprisonment of the latter was so peculiar that he was led to watch it. The ends of the two pseudopods of the Amœba gradually approached, came into contact, and then actually became fused, a thing which he had never before observed with the pseudopods of an Amœba. The Urocentrum continued to move actively back and forth, endeavoring to escape. At the next moment a delicate film of the ectosarc proceeded from the body of the Amœba, above and below, and gradually extended outwardly so as to convert the circle of the pseudopods into a complete sac, inclosing the Urocentrum. Another of these creatures was noticed within the Amœba which appeared to have been inclosed in the same manner.

This observation would make it appear that the food of the Amœba ordinarily does not simply adhere to the body, and then sink into its substance, but rather, after becoming adherent or covered by the pseudopods or body, is then inclosed by the active extension of a film of ectosarc around it.

The death of Dr. Jeffreys Wyman was announced.

SEPTEMBER 15.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

On the Motive Power of Diatomes.—Prof. LEIDY made some remarks on the moving power of diatomes, desmids, and other algæ. While the cause of motion remains unknown, some of the uses are obvious. The power is considerable, and enables these minute organisms when mingled with mud readily to extricate themselves

and rise to the surface, where they may receive the influence of light and air. In examining the surface-mud of a shallow rain-water pool, in a recent excavation in brick clay, he found little else but an abundance of minute diatomes. He was not sufficiently familiar with the diatomes to name the species, but it resembled *Navicula radiosa*. The little diatomes were very active, gliding hither and thither, and knocking the quartz sand grains about. Noticing the latter, he made some comparative measurements, and found that the Naviculæ would move grains of sand as much as twenty-five times their own superficial area, and probably fifty times their own bulk and weight, or perhaps more.

Dr. J. GIBBONS HUNT made the following remarks:—

While examining, this summer, into the structure of some of the so-called insectivorous plants, but more especially into the anatomy of the genus *Nepenthes*, I observed a part which I have not seen expressed before, and of sufficient interest, perhaps, to go upon record.

In the vegetable kingdom it is exceedingly rare to meet with glands which have distinct *excretory* ducts. Some authors deny their existence entirely; but in *Nepenthes rafflesiana*, *N. distillatoria*, and *N. phyllamphora*, and probably in all the species, are large cylindrical glands which pour out their secretion through *distinct excretory ducts*. In *N. distillatoria* these glands are, on an average, about the one-thirty-fifth of an inch long, and the one-twentieth of an inch wide, while the ducts measure about the one-thirtieth of an inch in length. In the *Rafflesiana* the glands and ducts are much larger. A dense tissue of cells surrounds and thoroughly imbeds these glands in *Nepenthes*, and this peculiarity of position renders excretory ducts necessary for the secretion to find its way into the pitchers.

In the vegetable kingdom it is the rule for glands to be located *on* surfaces, but in *Nepenthes* where one system of glands is *imbedded* the duct becomes necessary, and so far as I know is the only instance of such ducts among plants.

SEPTEMBER 22.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-five members present.

Remarks on Sponges.—Prof. LEIDY remarked that the animal nature and structure of the sponges were first clearly made known by Mr. H. J. Carter, of England, and Prof. H. James Clark, of this country. The sponges are compound, flagellate infusoria. The sponge infusorium had been appropriately named by Mr. Carter the spongozoon, the exact characters of which were first

noted by Prof. Clark, and confirmed by Mr Carter. The spongozoon is a globular cell, surmounted by a delicate cup, from the bottom of which projects a flagellum. The little animals are situated on the interior of hollow spheres of the sponges sustained by the skeleton of the compressed animal, whether this be corneous, as in the common sponge, or whether it be siliceous or calcareous. The observations of Prof. Clark had been made on a fresh water sponge, to which he had given the name of *Spongilla arachnoidea*. Mr. Carter's observations had been made on both fresh-water sponges and the different classes of marine sponges. Prof. Leidy at first supposed that the sponge described by Prof. Clark might be the one he had formerly noticed under the name of *Spongilla fragilis* (Proc. A. N. S. 1851, 278), but comparison proved them to be different. They are both of the same color, but the siliceous spicules of *S. arachnoidea* are stated to be tuberculate, while they are smooth in *S. fragilis*. Dr. Leidy had examined the spongozoon of the latter, and found that it presented the same essential structure as described by Prof. Clark and Mr. Carter in other sponges.

Prof. Leidy further remarked that he had found several specimens of the curious rhizopod, discovered by Cienkowski, and named by him *Clathrulina elegans*. They were found among Utricularia, but though retaining their stems were unattached and apparently dead. One of the specimens presented a peculiar and as yet unexplained character. On one side of the laticed head the orifices were capped with little inverted, hemispherical cups, from the top of which projected a funnel like the cup of the spongozoa. Prof. Leidy was pursuing his search for the living and attached *Clathrulina*.

Prof. LEEDS made some remarks concerning a remarkable mineral found in a bank of white sand near Fayetteville, N. C. It was, in appearance, a rod of glass, four feet in length and two inches in diameter, which was made up of a great number of irregular fragments. These fragments were highly polished on one side—the side apparently turned toward the hollow axis of the rod, and excessively contorted on the exterior side. They consisted almost entirely of silex, the remainder being chiefly oxide of iron. Accurate analysis showed that the percentages of the constituents in these siliceous fragments and in the sand found in the hollow core of the rod were the same. On account of this identity in composition, and the incompetency of any other known agent to produce such a fusion of almost pure silex, it was concluded that this "rod of glass" was a result of lightning—a *lightning-tube* or *fulgurite*, as such products have been called.

Prof. LEEDS also gave the particulars concerning a great elevation of temperature which had occurred in the adit level of a lead mine in Missouri, where the heat had suddenly risen from 60° to

over 100°, and had compelled the workmen, for the time being, to suspend work. The earth was found to contain over 75 per cent. of sulphate of protoxide of iron, and the heating had been due to the rapid absorption of oxygen by sulphuret of iron, disseminated throughout the earth in a finely divided condition.

Change of Habit through Fungoid Agency.—Mr. THOMAS MEEHAN referred to a former communication in which he exhibited specimens of *Euphorbia cordata*, or *E. humistrata*, collected by him in the Rocky Mountains, and which, normally procumbent, had assumed an erect habit on being attacked by a fungulus Æcidium Euphorbiæ hypericifoliæ.

He now found that the common trailing *Euphorbia* of our section, *E. maculata*, when attacked by the same fungulus, assumed the same erect habit. There was an additional interest in this observation, from the fact that with change of habit of growth there was a whole change in specific character in the direction of *E. hypericifolia*. In a comparison of the leading characters of the two species, we see that in *E. maculata* there is a profusely hairy stem, while that of *E. hypericifolia* is nearly smooth. The same is true of the fruit. The leaves of the former species are very oblique at the base—the latter nearly regular. The flowers are produced in all the axils. In the *E. hypericifolia* the stems have a tendency to be nodose at the joints, while *E. maculata* is nearly free from this character, and the flowers are mainly in heads at the ends of the branches. The *E. maculata*, after the fungoid attack becoming erect, also becomes nodose, and has the flowers on the ends of the comparatively smooth branchlets, while the leaves have lost their pointed obliquity; and, in short, all the characters make an intermediate between the two species.

He said it would not be fair to assume, from these facts, that *Euphorbia hypericifolia* was an evolution from *E. maculata*, but, as there could be no doubt that nutrition was one of the factors in the government of form, we could say that certain phases of nutrition, brought about by an attack of a minute fungus, would change the characters to the direction of those in that species.

SEPTEMBER 29.

The President, Dr. RUSCHENBERGER, in the chair.

Sixteen members present.

There not being a sufficient number of members present for the transaction of business, in accordance with the By-Laws, the meeting adjourned until October 6.

On favorable report of the Committee to which it was referred, the following paper was ordered to be printed:—

NOTES ON THE SANTA FÉ MARLS, AND SOME OF THE CONTAINED VERTEBRATE FOSSILS.

BY E. D. COPE.

The palæontological and geological examination, conducted by the party of the U. S. Survey, west of the north meridian, Lieut. G. M. Wheeler in charge, has already, during the present season, developed facts of interest, some of which are noticed below. The exploration has extended to the extensive lacustrine deposit in the valley of the Rio Grande, which has been termed by Dr. Hayden the Santa Fé marls. This author describes the deposits as first appearing in the north near Taos, and continuing for an unknown distance southward, and occupying the valley between the Rocky Mountains on the east, and the Jemez range on the west, he regards it as late Tertiary, but without special determination or co-ordination with the other known lacustrine formations of this continent.

Abundant material having been obtained by the party, it is easy to determine the fauna, whose remains are entombed in it, to be a part of that already described by Dr. Leidy and the writer, as occurring in Dakota and Colorado, under the name of Pliocene. This conclusion is indicated by the presence of the genera *Hippotherium*, *Protohippus*, *Procamelus*, *Cosoryx*, *Merychyus*, and known Pliocene species of other genera, among which may be mentioned *Canis*, *Aceratherium*, etc. In addition to species already known, a number new to science were obtained, of some of which descriptions are appended.

Martes nambianus, sp. nov.

Represented by a mandibular ramus which supports three teeth. The anterior blade of the sectorial is rather obtuse. The first premolar is one rooted; the second and third are without posterior coronal lobe, but exhibit small basal lobes, both anterior and posterior. The anterior of the second is rather elevated, and the entire crown is directed obliquely forwards. Canine compressed. Mental foramina below the second and third premolars.

Measurements.	M.
Length of three premolars	.006
Elevation of anterior lobe of sectorial.	.002
Depth of ramus at anterior lobe of sectorial . . .	.003

This species is of smaller size than the *M. mustelinus*, Cope,[1] and the sectorial tooth less elevated and trenchant.

Cosoryx ramosus, sp. nov.

Char. Gen.—Inferior molars prismatic, 3-3; the premolars all sectorial, last with short branch crests. Molars with basal intercolumnar tubercles. Horns superciliary, solid, branched.

This genus was indicated by Dr. Leidy from a horn of the species known to him, the *Cosoryx furcatus*, from the Pliocene beds of the Niobrara. The same, or a similar species, has left abundant remains in the Santa Fé marls, and, in connection with the more numerous *C. ramosus*, has enabled me to determine the dental and other characters of the genus.

After a careful examination of the horns of these species in my possession, those of eighteen individuals (at least I find that of ten where the basal portion is preserved), the beam has been broken off and reunited by anchylosis in six. In most of these the spot is marked by a ring of exostosed tuberosities, like those constituting the burr of the deer's horn. The fracture has taken place in every instance at a point as far above the frontal bone as the burr of deer is situated, and is irregular in outline, higher on one side than the other. In some of the specimens the smaller antlers are also broken, and exhibit a similar burr, but the terminal portion is usually lost. In one specimen, a broken antler is anchylosed in the usual manner of overlapping ends.

The horns are solid, the centre having a narrow spongy axis. The surface is dense, and marked by arterial grooves, but not pierced by noticeable foramina.

It is evidently a question whether this genus should be referred to the hollow or solid horned Ruminantia, to the *Bovidæ* or *Cervidæ*. The horns might be regarded as those of deer, were it not for the occasional specimens without burr, while the teeth are both cervine and bovine. We may here draw such inferences as we can respecting the nature of the covering of the horn. That the fractured beam should not be lost, indicates the presence of some kind of covering to retain it. That this covering was not horny, is probable from the fact that the horns are branched, a structure impossible to the *Bovidæ*, since antlers effectually prevent the usual mode of increase of horn by additions at the base and removal at the extremity. That such covering protected arteries,

[1] Hayden's Annual Report, 1874.

which aided in the production of the burrs, is also probable. We may thus believe it to have been dermal like that of the giraffe or the *Antilocapra* at the period of immaturity of its horny sheath.

It may be concluded then that the genus *Cosoryx* represents the ancestral type of the *Cervidæ*, and explains the origin of the remarkable type of horns of that family as follows: Ruminants with fixed horns of structure more dense and brittle than others of the same type, in their annual combats at the rutting season, very frequently broke the beams off not far above the base. The usual location of nutrition followed, which being annually repeated, became as periodical in its return as the activity of nutrition of the reproductive system. This activity ceasing, the horn being dense lost its vitality, the more so as the normal covering would have already perished in its distal portions. The natural consequence, the separation of the dead from the living bone by suppuration, would follow. This process would, however, probably require a longer time for the establishment of its periodical return than the fracture and attachment of the existing horn.

This appears to be the only explanation of the origin of the phenomena exhibited by the horns of the *Cervidæ*, and is suggested by the specimens of *Cosoryx* to be described.

Char. Specif.—This species is larger than the *C. furcatus*, Leidy, and exhibits two antlers instead of one, of which the first is given off at a point much further from the base than in that species.

The beam near the base is curved a little inwards, and is semicircular in section, the outer face being slightly concave, the inner very convex. The base is situated a short distance within the free superciliary border. The beam becomes more cylindric, and then expanding in a fore and aft direction, gives off an antler at right angles, nearly parallel to the cranial axis. At a distance little over half the elevation of the first antler, the beam gives off a second, in a plane transverse to the axis of the skull. The terminal portion of the beam is cylindric, curved, and acute at the apex.

Mandibles with teeth of two species of this genus were found, the smaller of which, occurring with the other portions of *C. furcatus*, belong to it. The larger differs in the elevation of the intercrescentic column of the first molar, which is worn into a loop at ordinary maturity; this may however be but an individual variation. The diastema is long, and the ramus of that point quite slender.

Measurements.	M.
Long diameter base No. 1	.016
" " " " 2	.020
Elevation of first antler from base No. 1	.080
" of second antler from first No. 3	.042
Length of terminal part of beam No. 4	.095
" of molars 2–5, No. 5	.037
" of molars 4–5, No. 5	.022
" of fifth molar	.012
Width of fifth molar	.006

Coseryx teres, sp. nov.

Established on the connected frontal bones supporting the horns of one specimen, and represented by portions of horns of two others. The former individual is larger than any one belonging to the other species, and the species is doubtless the largest of the genus. The horns stand above the posterior part of the orbit, which excavates its base, and presenting a considerable face descending into the temporal or zygomatic fossa. There is no free superciliary rim outside of the base as in *C. ramosus*, Cope. The section of the beam near the base is a regular oval, the long axis directed longitudinally and a little outward in front. The beam is erect with a slight curvature outwards at the inner base only. So far as preserved it does not branch, but may do so in its distal portion which is lost. The tissue is more spongy interiorly than in the other species; supra-orbital foramen far within the superciliary border.

Measurements.	M.
Outer width between bases of horn cores	.112
Inner width between bases of horn cores	.055
Width of temporal fossa behind horns	.053
Long diameter horn core	.028
Short diameter horn core	.021
Length of part preserved	.033

This species was as large as the *Antilocapra americana* of the plains.

Hesperomys loxodon, sp. nov.

An entire mandibular ramus with all the teeth preserved, was found in the same deposits as the preceding species. Molars subequal, short-crowned, triturating surface sigmoid. The apices of the sigma on the inner side, tubercular, and anterior to the outer apices. First molar with an additional transverse crest in front. Incisor compressed, outer angle of enamel face rounded, smooth. Molar series oblique, rising anteriorly.

Measurements.	M.
Length of molar series	.0050
" of first molar	.0018
Depth below last molar (inner side)	.0030
" below first molar	.0045
" of incisor	.0015
" as diastema	.0027

Panolax sanctæfidei, gen. et sp. nov.

Char. Gen. Molars prismatic, transverse, except the first and last, each divided by a plate of enamel extending transversely from the inner side. Anterior molar longitudinal; posterior molar composed of two columns.

This genus is represented by numerous teeth and portions of the cranium. It evidently belonged to the *Leporidæ*, and is allied to both *Lepus* and *Palæolagus*. As the teeth are mostly separate, it is not easy to determine which is the posterior and which the anterior molar. Judging by the analogy of the known species, the determination as here made is correct; should the relations be reversed the species will be referred to *Palæolagus*.

Char. Specif. The teeth are curved, the convexity inwards. Inner face grooved, the groove occupied by cementum; the outer border compressed either without or with very shallow groove. First molar with triturating surface twice as long as wide with an entering loop of enamel on the inner side, anteriorly narrower. Last molar as wide antero-posteriorly as transversely, the shaft curved backwards; the posterior column sub-cylindric half the diameter of the anterior.

Measurements.		Inch.
Diameter of middle molar	antero-posterior	.093
	transverse	.187
" first molar	antero-posterior	.140
	transverse	.062
" last molar	antero-posterior	.100
	transverse	.065
Length of crown of last molar		.250

This species is about the size of the northern hare.

Cathartes umbrosus, sp. nov.

Represented by numerous portions of nearly all parts of the skeleton, in excellent preservation. The beak from the frontal bone to near the apex is preserved; it displays the depression just anterior to the nares, which marks the anterior boundary of the

cere. The culmen is nearly horizontal to just beyond this mark, and then exhibits a gradual decurvature to the apex. The beak is strongly compressed, and the tomia strongly decurved, forming an open festoon, whose middle point marks one-fourth the length of the beak from the nares. The latter are directed obliquely downwards and forwards, narrowing anteriorly, and having a prominent inferior bounding ledge. The mandible is weak, the symphysis marking on half the length of the beak, from the anterior angle of the nares.

The bones of the anterior extremities exhibit large and powerful proportions as compared with the posterior, appropriately to capacity for sustained flight. The head of the humerus is much compressed, and the articular face is nearly divided into two by the deep bicipital groove. The head of the femur is small, and the rotular face, a wide and deep groove. The tibia is slender, the shaft much compressed, with a prominent ridge. The cnemial crest is short, and not produced downwards on the shaft. The distal posterior bridge is narrow and oblique. The tarso-metatarsus has a strong exterior crest which constitutes half the width of the shaft.

Measurements.	Inch.
Length of beak from base of culmen (axial)	1.90
" from cere to apex (")	1.20
Depth of beak at culmen	.87
" of pre-maxillary at festoon	.75
Length of symphysis	.69
" of nares	.37
Width of palate at festoon	.50
" of head of humerus	1.37
" of condyles	1.13
" of distal end femur	.94
" of head of tibia	.81
" of condyles of tibia	.66
" " of tarso-metatarsus	.75
Length of a first phalanx	1.12
" of seven sacral vertebræ	1.87
" of two dorsal vertebræ	1.12
Depth of a dorsal vertebra (total)	.93
" " " to roof of arch	.44
" of centrum of roof of arch	.25
Width of " " "	.32
Length of two cervical vertebræ	1.12
Depth " " to apex neural spine	.44
" of articular face centrum	.17
Width " "	.25

Conrad's Fossils of the Pebas Group

TRIPHASIC OF BRACHYPUS ATELES AND MACACUS.

CHAPMAN ON ATHEL.

OCTOBER 6.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-nine members present.

Wheat and Chess.—Mr. THOMAS MEEHAN introduced a subject which he said had never before, to his knowledge, been brought directly to the attention of a scientific body—the popular belief that wheat will turn to chess. The scientific world might well be pardoned for deriding such an idea, for if so distinct a genus as *Triticum* can be found to produce a *Bromus*, the most exaggerated notion of the "leaping" power of nature must be enlarged in considering theories of evolution. Yet he might say he had seen many popular impressions, derided by men of science, prove true. When a boy his agricultural friends insisted that the same toad which would deposit its eggs in water when convenient, would bring forth its young alive when deprived of the water privilege. He had proved the fact by keeping toads in breeding condition in confinement, and counting the toadlets when certainly not more than a few days old. The idea was once derided by intelligent men, but he believed most zoologists now admit that the common toad is oviparous or viviparous according to circumstances. In like manner in his youth he saw five young snakes, one after another, enter the mouth of the parent when alarmed. This was a universal belief of country people; yet only last year, on overwhelming evidence before the American Association, was it admitted as scientific truth. Again, during the past year we had seen how a popular belief in regard to an apparent elongation of tree trunks had proved to be true, though the popular reasoning was wrong. We now know that trees may sometimes be lifted from year to year by the gradual thickening of roots growing over a rocky base, so that a side branch, which in a young tree is opposite to a mark, may, in time, be as much as a foot above it, as popular observation contends it sometimes will. With these things in mind he had held himself open to give even some trouble to get reputed facts with reference to this question of chess. He now exhibited one of several specimens sent him by Mr. Levette of the Indiana Geological Survey, and proceeded to point out that there could be no mistake about the branch from the wheat ear being *Bromus secalinus*, the common chess, so far as the palea and glumes were concerned. In the flowers he had dissected he found no perfect grain to compare with wheat. In instances previously recorded there seems never to have been any dispute about the appearance from the wheat head being the real *Bromus*. But it had been contended that in these cases an examination had

shown an accidental union of two culms, one from each plant, and which, in some way, had formed an apparent union one with another. This appeared not to be the case in the present specimen. In the wheat ear the small clusters of flowers inclosing the ultimate grain, came out at each bend of the zigzag rachis. The spike of chess appeared to come out at one of these bends, the lowermost, taking, in fact, the place of one of these small clusters. It was not an accidental union of two distinct parts, but apparently a substitution of one part for another. Again the *Bromus secalinus* rarely gets as tall as wheat, especially so tall as this strong looking wheat head had evidently grown. There was, he said, another remarkable fact connected with the popular reports. Many other grasses grow with wheat as well as *Bromus secalinus*, the common chess or cheat. It was apparently as easy for any of these to become accidentally conjoined with wheat as this, but no case is brought forward. There was enough in appearance, he thought, that deserved further investigation.

On Mr. Meehan's motion, the specimen was referred to the Biological and Microscopical Section for examination.

New Growth of Plants.—Mr. JOHN H. REDFIELD called the attention of the Academy to some curious facts recently observed by Mr. C. F. Parker. On some low marshy ground near the Delaware River below this city, was deposited in the spring a large amount of mud dredged from the channel of the river. The mud was spread to the depth of several feet over a space of more than an acre in extent, for the purpose of raising the level. Later in the season over this whole area sprung up a growth composed almost exclusively of two plants, viz., *Polygonum orientale*, an East Indian species (which occasionally occurs on waste ground), and *Cleome pungens*, a West India species of less frequent occurrence. The former plant constituted the mass of the growth, though there may have been more than one hundred plants of the *Cleome* scattered among the growth. One or two specimens of *Quamoclit coccinea*, also a naturalized species, were likewise noticed. Mr. Parker had also previously observed a similar case upon Smith's Island, and also in two localities in Camden, where channel mud had been thus deposited. Mr. Redfield thought it an interesting inquiry as to whence the seeds of these plants originated, and how they had survived their long burial in the river mud.

Dr. Leidy thought that as the vicinity had long been used as a place for the deposit of ballast from ships, the seeds might have laid upon the ground previously, and have been quickened by the deposit of the mud.

Mr. Meehan referred to some recent discoveries as to the effect of oxygen in the germination of seeds, and thought that perhaps the seeds of these plants, protected from air while buried under

water, might, under exposure to the air, germinate. He referred to other cases of the springing up of new plants after the deposit of fresh earth, and suggested a mode of testing the origin of the seeds.

Dr. Carson and Mr. Aubrey H. Smith called attention to the great change which, during late years, had occurred in the vegetation of the neck below the city.

On Asplenium ebenoides.—Mr. Redfield then alluded to the fern known as *Asplenium ebenoides*, described some years ago by Mr. Scott, from a few plants found on the rocky banks of the Schuylkill above Philadelphia. Most of our botanists have doubted the validity of the species, and have supposed it to be an abnormal or hybrid form originating from *Camptosorus rhizophyllus* (Walking Fern), and *Asplenium ebeneum*, both of which species occur abundantly at the locality. Recently a few plants of the same form have been found near Havana, Alabama, by Miss Tutwiler, and in precisely the same suspicious company. Her account may be found in the *Bulletin* of the Torrey Club for May, 1873. Recently Mr. A. H. Curtiss, of Liberty, Va., has received from Alabama a frond of this fern, *rooting at the apex*, precisely as the walking fern does. Mr. Redfield thought this fact tended to confirm the doubts already entertained upon the validity of the species.

Notice of some Rhizopods.—Prof. LEIDY remarked that since he had made a communication on *Deinamœba mirabilis* he had had the opportunity of examining a number of additional specimens. All of them appeared to be variegated with twin spots of green, which he found to be due to the scattered joints of two species of desmids of the genus Didymoprium, swallowed as food. He had observed the animal swallow a considerable portion of a filament of *Didymoprium Grevillii*. In another instance he had seen an individual eject upwards of fifty joints of *Didymoprium Brebissonii*, from three different portions of the body simultaneously. Another peculiarity he had observed in the animal which had previously escaped his notice. The body appears to be surrounded or enclosed in what might be called an atmosphere of minute spicules, which can be seen as a circle a short distance beyond the outline of the body.

Prof. Leidy then presented drawings and descriptions of a number of Difflugians which he supposed to be new. They were mostly found in a pond in Absecom Creek, New Jersey, and in the sphagnum on the border of the pond. Most of the same species were likewise found in a sphagnous swamp of Longacoming, and in the sphagnum on the border of Lake Hattacawanna, New Jersey.

DIFFLUGIA VAS. Test composed of angular quartz particles, generally coarse, shape pyriform, with the neck constricted where it joins the body; fundus obtuse; mouth large, circular. Ento-

sarc bright green from the abundance of chlorophyl granules. Length of test $\frac{2}{5}$ mm.; neck one-fourth to one-third the length of the test. Abundant in Absecom Pond, New Jersey.

DIFFLUGIA OLLA. Test composed usually of angular quartz particles, and occasionally of diatome shells; form pot-like, with a spheroidal body, a contracted neck, a large circular mouth, a reflected lip, and obtuse, divergent spines projecting from the fundus. Entosarc colorless. Length of test $\frac{1}{5}$ mm. Abundantly found with the preceding. The form is intermediate to *Difflugia corona* and *D. lageniformis* of Wallich.

CATHARIA. Difflugians with a membranous, structureless test without adherent particles of foreign matter.

DIFFLUGIA (CATHARIA) PAPILIO.—Test pale yellow, transparent, compressed pyriform, width less than half the breadth, border acute; mouth transversely oval. Entosarc with many chlorophyl globules, and attached by many bands to the inner surface of the test. Pseudopods digitate. Length of test 0.112 mm., breadth 0.072 mm., width 0.032 mm. The living animal, from its varied colors, is very handsome. Abundant in the sphagnum of Absecom, of Longacoming, and of Lake Hattacawanna, New Jersey.

DIFFLUGIA (CATHARIA) ELEGANS.—Test pale brown, compressed bottle-shaped, width about one-half the breadth, border obtuse, surface with shallow conical depressions; mouth transversely oval. Entosarc colorless, or yellowish from the food balls. Length $\frac{1}{70}$ mm.; breadth $\frac{1}{35}$; width $\frac{1}{60}$ mm. Very abundant among the sphagnum of Absecom, of Longacoming, and of Lake Hattacawanna, New Jersey.

NEBELA.—Difflugians with an areolated test.

DIFFLUGIA (NEBELA) ANSATA. Test compressed pyriform, width about two-thirds the breadth, laterally obtuse and furnished with a pair of handle-like processes projecting at the base of the neck, and extending nearly parallel with and about one-third the length of the body, colorless, transparent; areolæ appearing circular or hexagonal; mouth transversely oval. Entosarc colorless, or yellowish from the food balls. Length 0.22 mm., breadth 0.1 mm., width 0.72 mm.; length of handles 0.04 mm. A rare form among the sphagnum of Absecom, having only found it twice. Remarkable for the large hollow handle-like processes of the test.

DIFFLUGIA (NEBELA) EQUI-CALCEUS. Test compressed pyriform, the width about one-half the breadth, colorless, transparent; circularly or hexagonally areolated, laterally acute and with the body carinated. Carina deep and thick, and seen in the broad view of the test as a horse-shoe like production with the extremities free and projecting into the interior of the test towards the mouth. Entosarc colorless, or yellowish from the contained food-balls. Length $\frac{1}{4}$ mm., breadth 0.14 mm., width 0.072 mm. Also rare, and found in the same locality with the preceding, with which it is equally remarkable, from the existence of the singular horse-

[illegible]

October 13.

The President, Dr. Ruschenberger, in the chair.

Sixteen members present.

The Seibert Collection of Minerals, which was completed in 1820, was received on deposit, and ordered to be preserved intact under that name as historic evidence of scientific progress.

Variations in Solanum Fendleri, A. G.—Mr. Thomas Meehan said that among other agricultural and horticultural plants the history of the potato was not clearly known. It was said to be a native of Mexico, Chili, and Peru, but he doubted whether it had been found anywhere beyond all question indigenous. *Solanum Fendleri*, A. Gray, had much in common with *S. tuberosum*. The flowers and foliage differed chiefly in being much smaller in all their parts. He had plants under culture for eight years, but could not find any variation in the shape and size of the tubers until this year, when they have begun to vary in the direction of the common potato. Hitherto, the tubers have been round, about the size of a large bullet, and rugose from the imperfect tuber cells on the surface. This season the roots have varied in the direction of the common potato. They are oval and compressed, and one has reached a dimension of one inch wide and two inches long, and with the skin clear and semi-translucent as we see in more delicate potatoes. He thinks, however, that these facts do no more than suggest a possibility of the unity of origin of the *Solanum Fendleri* and *Solanum tuberosum*. The fact, that the former tubers will endure a temperature of zero in the ground, while the latter was so easily destroyed by frost, might, indeed, be considered against such possibility unless we could conceive of some physical change coexistent with a change of form.

Crystallization in Plants.—Dr. J. Gibbons Hunt remarked that the subject of crystallization in plants, though not new to botanists, is interesting because of the extreme beauty of these deposits, and, also, an account of the obscurity of their origin and true significance in the life-history of the plants. The entomologist, perhaps, has need for alarm, because some botanists assert that some plants devour the special objects of his study; but, I think, the mineralogist might feel equally jealous to learn that the all-devouring plants were busy picking up his crystals from the inorganic kingdom, and using them, at least, to beautify their own tissues.

I would ask attention, at this time, to only one form of plant-

shoe-like production. It resembles the *Difflugia carinata* of Archer, but this appears to be devoid of the horse-shoe.

DIFFLUGIA (NEBELA) SPHAGNI.—Test pale yellowish, compressed ovoid, width little more than half the breadth, borders obtuse, surface reticular; mouth large, transversely elliptical and with acute commissures. Entosarc bright green, from the multitude of chlorophyl grains; pseudopods numerous, digitate Length $\frac{1}{10}$ mm.; breadth $\frac{1}{12}$ mm.; width $\frac{1}{25}$ mm. Very abundant among the sphagnum of Absecom. In some specimens the border of the fundus of the test is loaded with quartz particles. Frequently the animal is observed in a passive state with the mouth of the test closed by an epiphragm, and the sarcode appears as a discoid ball $\frac{1}{18}$ mm. broad, and $\frac{1}{28}$ mm. thick.

DIFFLUGIA (NEBELA) NUMATA. Test colorless, broadly compressed pyriform, about half the width of the breadth, borders subacute; surface covered with oval or circular disks, resembling in appearance blood disks; mouth transversely oval. Entosarc transparent, colorless or yellowish from the food contents, attached by long bands to the inner periphery of the test; pseudopods coarse digitate. Length $\frac{1}{7}$ mm., breadth $\frac{1}{10}$, width, $\frac{1}{20}$ mm. Abundant in the sphagnum of Absecom, and Lake Hattacawanna, New Jersey. A beautiful form. The discoid areolar structure is very variable, and is frequently mingled with more or less bodies of linear form.

DIFFLUGIA (NEBELA) BARBATA. Test colorless, circularly areolated, slightly compressed bottle-shaped; neck long, body ovoid, mouth oval; surface of test everywhere finely hirsute. Entosarc colorless, or yellowish from the food contents. Length $\frac{1}{8}$ mm.; breadth of body $\frac{1}{21}$ mm., of neck $\frac{1}{50}$ mm.; width of body $\frac{1}{25}$ mm. Rare in the sphagnum of Absecom, New Jersey.

DIFFLUGIA (NEBELA) FLABELLULUM. Test colorless, compressed spheroidal, broader than long and width less than half the breadth; neck slight or nearly obsolete; surface of test with round, oval and bacilliform areolæ. Entosarc colorless, or centrally yellowish from food balls. Length of test $\frac{1}{12}$ mm.; breadth $\frac{1}{11}$ mm.; width $\frac{1}{25}$ mm. Abundant in the sphagnum of Longacoming swamp, New Jersey.

The business of the adjourned meeting of Sept. 29th having been resumed, Charles Dutilh, George Washington Smith, J. E. Mitchell, Jno. Leisenring, Charles Parrish, Charles Baeder, William Adamson, Charles B. Baeder, Wm. B. Adamson, Charles W. Poultney, Karl Seiler, M.D., and Mrs. Amelia D. Hockley were elected members.

H. W. Hollenbush, of Reading, Pa., Prof. Peter MacOwen, of Somerset, East South Africa, J. Fayrer, M.D., of Calcutta, and A. L. Siler, of Osmer, near Glendale, Utah, were elected Correspondents.

Engelmann, after his distinguished friend, and which name it still retains, he found a considerable quantity in that cañon also. He was attracted by the light green cones, as distinguished from the purplish ones of *Abies grandis*, but on climbing the trees, and examining the characters, he concluded it was but a variation from *A. grandis*, similar to what he was already familiar with in *A. balsamea*. Prof. Porter had also found it in Cheyenne Cañon, in 1872; and, if really distinct from *A. grandis*, it is probably much more widely diffused through the Rocky Mountains than has been supposed.

Fertilization of Gentiana.—Mr. THOMAS MEEHAN called attention to the fact that the autumn-blooming gentians were now in flower; and a close investigation promised an interesting field to the botanist. They belonged to the class with gelatinous pollen, and which was now believed to require the aid of insects in fertilization; but many of our species had closed corollas, which seemed to make fertilization by this agency difficult. In connection with this subject he said Dr. Engelman had made some curious observations on the gentians of the Rocky Mountains. All the large flowered species (as *Gentiana affinis*, *G. frigida*, *G. Parryi*, etc.) have the anthers definitely fixed, and open outwards towards the corolla; while those of the smaller species (such as *G. acuta*, and neighboring genera, *Swertia and Pleurogyne*) have the face of the anthers directed towards the ovary at an early stage of development, but, on expansion of the corolla, are thrown over the filament, and then face outwards as the others. The stigma is cloven, but the lobes do not expand till several hours after the anthers have shed their pollen. Mr. Meehan finds the anthers of the large flowered eastern species accord with Dr. Engelman's observations on the Colorado ones, in having the anthers fixed from the first outwardly, at least in all that he has been able to examine.

Variations in Leaves of Ailanthus glandulosa.—Some leaflets gathered from the trees by Dr. H. Leffman were exhibited, in which the usual lanceolate form was departed from, and a triangularly hastate, or acceriform shape, assumed.

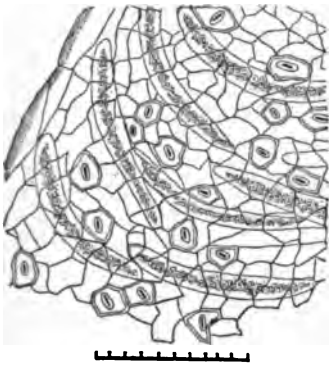
Note on Dryocampa.—Prof. LEIDY stated that the oaks in the forests of New Jersey, during the last summer, were greatly devastated by the Dryocampa senatoria. In the early part of September, in passing along the edge of a forest skirting a cranberry swamp, at Absecom, New Jersey, he had observed multitudes of the Dryocampa lying dead on the swamp and all bristling with the singular fungus Achlya prolifera.

The death of M. Elie de Beaumont, a correspondent of the Academy, was announced.

crystal—the cystolith—so called because the aggregation of crystals is inclosed in a capsule or cyst within a special cell, and is, moreover, connected with its cell by means of a delicate filament, differing in *this* particular from *all other* cell-contents.

In our common nettle (*Urtica*) we meet with the ordinary form of cystolith. A simple aggregation of minute crystals—probably oxalate of lime—nearly circular in form, showing the capsule plainly which envelops them, and also the special cell containing the cystolith. About six hundred fill a line an inch long, and four hundred are found in one square inch. Each cystolith contains about one hundred individual crystals. At lowest estimate, therefore, forty thousand crystals exist in one square inch of nettle leaf.

In *Pilea muscosa*—a near ally of *Urtica*—I find a type of cystolith differing widely from all forms heretofore described. They are elongated and bent, in form, like an Australian boomerang. They lie in cells measuring only the $\frac{1}{70}$ of an inch long, and the $\frac{1}{850}$ wide; and so abundant that quite one-third of the entire leaf is occupied with them. Cystoliths of this magnitude and singular form I believe to be unknown to botanists. The filament connecting each one with its cell-wall is apparent.



1000th of an inch.

What is the significance of these plant-crystals?—and there are others more numerous and more beautiful—what their office in the life of the plant? what part do they act in supplying the salts of lime, potash, and soda to the tissues of animals? Will scientific agriculture answer?

The death of Thomas Sparks was announced.

OCTOBER 20.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-four members present.

Abies concolor in Colorado.—Mr. THOMAS MEEHAN announced the discovery of *Abies* (*Picea* of Loudon) *concolor* in Glen Eyrie, near Pike's Peak, in Colorado, by Dr. Engelmann. When, however, he explored what was till then an unknown cañon in 1871, and which by right of a first discovery he had named Cañon

Engelmann, after his distinguished friend, and which name it still retains, he found a considerable quantity in that cañon also. He was attracted by the light green cones, as distinguished from the purplish ones of *Abies grandis*, but on climbing the trees, and examining the characters, he concluded it was but a variation from *A. grandis*, similar to what he was already familiar with in *A. balsamea*. Prof. Porter had also found it in Cheyenne Cañon, in 1872; and, if really distinct from *A. grandis*, it is probably much more widely diffused through the Rocky Mountains than has been supposed.

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OCTOBER 27.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-five members present.

Chapter XIV., Art. V. of the By-Laws was amended to read as follows: "Six members shall constitute a quorum. Except the election of members and correspondents, no question other than purely scientific shall be decided at any meeting unless at least twenty members vote;" the words "except the election of members and correspondents" being added to the original article.

The following paper was presented for publication:—
"Synopsis of the Muridæ of North America." By Dr. Elliott Coues, U. S. A.

W. S. Bissel, Dr. A. M. Owen, U. S. N., James Dougherty, Daniel Maul, John Rothermel, John B. Robinson, Charles H. Howell, and Mrs. Elizabeth V. Graham, were elected members.

Dr. A. E. Carothers, of Saltillo, Mexico, was elected a Correspondent.

On report of the Committee to which it was referred, the following paper was ordered to be published:—

cells, but in granules differently formed in the wheat, from those in the cheat.

It is impossible to convey in words, an idea of this difference in form. In the cheat the silica granules are larger and more abundant than in wheat.

In the upper glumes of both plants there are from three to nine veins. In the wheat not more than *one* vein is bordered with stomata, in cheat *every vein* has on either side a distinct row of large stomata, and this peculiarity of structure is so distinctive that the botanist can pick from a bushel of the mixed glumes of both plants, all that belong to the cheat, without possibility of mistake. Other points of dissimilarity are obvious, but I have stated enough to make a comparison with the doubtful outgrowth.

In this doubtful outgrowth from the head of wheat I find the obliquely ending internal cells in the upper glume, in the epidermal cells, silica deposits identical in form and position with the cheat, and unlike the wheat, and every vein is bordered with a row of stomata on either side. Every morphological element of the outgrowth corresponds in form to analogous elements in the cheat. I am compelled therefore to pronounce it undoubted Bromus and not Triticum. But I would report further.

Seize now, very gently, this remarkable outgrowth, with delicate forceps, and out comes the Bromus from the Triticum, and the trick is exposed. The Bromus has been introduced into the Triticum artificially, and the cement employed to make the deception more secure still adheres in flakes to the artificial parasite, and resembles in appearances gum tragacanth. A beautiful fungus, moreover, has found a nidus in the gum solution while fresh, and is not found elsewhere on the wheat. The stem of the Bromus which was inserted into the wheat, bears on its epidermal surface minute outgrowths resembling precisely those on the corresponding parts of the plant which is separate from the wheat. Now, on *naturally* internal surfaces such epidermic outgrowths never occur; I have no hesitation, therefore, in pronouncing this specimen *cheat*, neither do I think the workman has been expert in his manipulation.

NOVEMBER 10.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

A paper entitled "Description of a new species of Helminthophaga," by Harold Herrick, was presented for publication.

Mountain Drainage of Eastern Tennessee and Western North Carolina. Ancient Burial Custom.—JOSEPH WILLCOX made some statements in reference to the drainage of the mountain region of

NOVEMBER 3.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

A paper entitled "On new species of Noctuidæ," by Aug. R. Grote, was presented for publication.

The President read the following extract from a letter written by Prof. Edw. D. Cope, and dated "Camp near Nacimiento, N. M., Oct. 11, 1874:" "I have been camped for some five weeks in this region with five men, forming one of Lieut. Wheeler's surveying parties. I find much of interest geologically, paleontologically, and archæologically, and have an agreeable location in a country with good water, timber, and grass, and, I may add, Indians. The latter are Apaches, Utes, and Navajoes, all friendly. I find many remarkable ruins of rude stone buildings of an extinct race, with great quantities of broken pottery. I discovered a ruined stone village of twenty-five houses arranged on the edge of a cretaceous sandstone hog-back, from six to twelve feet wide only, and 250 to 300 feet perpendicular on one side, and on the other sloping at an angle of 45° to 60°, besides other ruins in regions now entirely waterless."

Dr. F. V. Hayden exhibited a series of photographs of ruins similar in character to those spoken of by Prof. Cope. The builders were supposed to be the ancestors of the Moquis.

Wheat and Chess.—The specimen of wheat (*Triticum*) with a head of cheat (*Bromus*) apparently growing from a joint of the former plant, which had been presented to the Academy at the meeting of Oct. 6, having been referred to Dr. J. GIBBONS HUNT for examination, he made the following report:—

After rendering the chaff of both plants transparent, and tinting properly, so as to render every morphological element distinct for study, and after treating the doubtful outgrowth similarly, I present the three specimens to the members for study.

I will call attention to only a few points of structure in each. In the upper glume of the wheat, on the inside surface against which the grain lies, the cells are large, and are bounded at their *ends* by cell-walls nearly *transverse* to the long diameter of the cells. In corresponding cells in cheat the ends of the cells are bounded by *oblique* lines generally. In the outer or epidermal cells of both plants silica is abundant, the deposit occurring at the *ends* of the

and the genera *Symborodon* and *Miobasileus* of Prof. Cope belong.

Last summer, in passing through New Haven, I had an opportunity of seeing the fossils referred by Prof. Marsh to *Brontotherium*. Among them I saw an incisor tooth, which is like one in the museum of the Academy. The latter specimen accompanied some remains of *Titanotherium* from White River, Dakota. The crown forms an irregular hemisphere, and measures from 5 to 5½ lines in diameter.

The examination of the skull, described by Prof. Marsh, under the name of *Brontotherium*, and an inspection of the skulls, exhibited to the Academy last June by Prof. Cope, and referred by him to *Symborodon*, confirmed my suspicion that these two named genera are synonymous with *Titanotherium*. I also suspect from the cursory examination of the specimens of Profs. Marsh and Cope, that the number of species will probably be reduced to one or two.

Notices of Rhizopods.—Prof. LEIDY exhibited drawings of the beautiful Actinophryan, *Clathrulina elegans*, described by Cienkowski and other European naturalists. It was found abundantly on Utricularia, at Absecom, New Jersey. The more mature specimens have a brownish or yellowish color. The spherical, fenestrated, siliceous shell measures from $\frac{1}{28}$th to $\frac{1}{12}$th mm. in diameter. The interior Actinophrys-like body is about $\frac{1}{30}$th mm. in diameter, and gives off a multitude of delicate rays which extend through the fenestra of the shell. The stem of attachment of the shell measures $\frac{1}{4}$th of a mm. or more in length.

The maturer specimens frequently have others attached to their shell, usually one, but as many as six were observed radiating on their slender stems from the parent shell. These secondary shells are slightly smaller than the others, are colorless, and often so delicate and transparent that the fenestrate character, if it exists, is invisible.

In a number of detached specimens of *Clathrulina*, the shell was occupied by a central, rayless, granular mass, from $\frac{1}{80}$th to $\frac{1}{40}$th mm. in diameter.

Prof. LEIDY also exhibited drawings of *Actinosphærium Eichhornii*, which, though not so common as *Actinophrys sol*, is frequently found in the ponds and ditches in the vicinity of Philadelphia. It varies considerably in size, ranging from $\frac{1}{12}$th mm. to $\frac{1}{2}$ mm. in diameter. Some exhibit a multitude of rays, others a few, and some observed, of large size, alive and active, were utterly rayless.

Drawings were also exhibited of *Acanthocystis viridis*. This remarkable rhizopod occurs frequently in all the ponds and ditches in the vicinity of the city. It is either very polymorphous, or else perhaps several species may be included under the one name.

Eastern Tennessee and Western North Carolina. The Blue Ridge there attains its greatest development, both in width and altitude; its width being from 50 to 70 miles, while more than 30 of its peaks attain an altitude exceeding 6000 feet. The western border range, called the Smoky Mountains, is as high as the eastern range, styled the Blue Ridge; yet all of the streams that drain this region flow to the west, cutting deep gorges through the Smoky Mountains. Having visited this region on several occasions recently, Mr. Willcox observed that the eastern and central portions of it consist of gneiss rocks, while the western portion is composed of other sedimentary rocks. It is presumed that the former was upheaved at a time long anterior to the elevation of the latter, and the drainage system, having once been established to the westward, continued its erosion during the subsequent elevation of the Smoky Mountains.

Mr. Willcox also stated that when recently in North Carolina his attention was called to an unusual method of burial by an ancient race of Indians in that vicinity. In numerous instances burial places were discovered where the bodies had been placed with the face up, and covered with a coating of plastic clay about an inch thick. A pile of wood was then placed on top and fired, which consumed the body and baked the clay, which retained the impression of the body. This was then lightly covered with earth.

Notice of Remains of Titanotherium.—Prof. LEIDY directed attention to two fossils recently received through Prof. Hayden. They consist of an isolated last lower molar tooth and a lower jaw fragment containing three teeth. The specimens are part of a skeleton, most of the bones of which were found about one hundred miles east of Greeley, Colorado.

The last lower molar tooth is identical in character with that referred to *Titanotherium Proutii* (*Ancient Fauna of Nebraska*, pl. xvii. figs. 8, 9, 10), except that its outer basal ridge is less well developed. The fore and aft diameter of the crown is three and one-quarter inches; the width in front 19 lines.

The teeth of the lower jaw fragment are either the last three premolars, or the last two of these and the first molar. They are like the corresponding teeth of *Titanotherium Proutii*. In all, the crowns are bilobed. The series of three teeth measures, fore and aft, four inches and five lines. The first of the series measures, fore and aft, $14\frac{1}{2}$ lines; the second $16\frac{1}{4}$, and the third 21 lines. A large mental foramen is situated about an inch and a half below the interval of the anterior two teeth.

These remains I suspect to belong to the animal indicated under the name of *Megacerops coloradensis* (*Extinct Vertebrate Fauna* of the Western Territories). This, from all the evidence I have thus far seen, appears to be of the same genus as *Titanotherium*, to which I also suspect the genus *Brontotherium* of Prof. Marsh,

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Some are green from the chlorophyl balls occupying the superficial part of the body. Others exactly alike in all other points of structure are colorless. From the body project a multitude of exceedingly delicate spines with discoid bases and furcate ends. Rays also like those of *Actinophrys* project beyond the spines. Both rays and spines in the immediate vicinity of the body are enveloped in a stratum of exceedingly minute vibrio-like spicules. The green specimens of *Acanthocystis*, independently of rays and spines, measure about $\frac{1}{10}$th mm. in diameter; the colorless ones measured about one-half the size of the former.

Drawings were also exhibited of an Actinophryan, of which a number of individuals lived together in colonies. These are not unfrequently met with in the same positions as *Acanthocystis* and *Actinosphærium*. The species appears to be the same as that recently described by Hertwig and Lesser, in the *Archiv fur Mikroskopische Anatomie*, 1874, plate iv. fig. 1, under the name of *Raphidiophrys elegans*. I have repeatedly met with the creature in colonies from half a dozen up to forty. The whole colony moves along with much greater rapidity than *Actinophrys sol*. The individuals measure $\frac{1}{25}$th mm. in diameter, and project a multitude of rays extending to $\frac{1}{5}$th mm. in length. In colony the bodies are conjoined by bridges or isthmi, through which chlorophyl balls and granules incessantly but slowly pass from one to another. The bodies and the bases of the rays are enveloped in an atmosphere of exceedingly delicate semicircular spicules. The animals take their food in the same manner as *Actinophrys sol*. A colony of thirty-eight was observed to break up into three separate colonies numbering severally fifteen, ten, and thirteen, each of which moved away in a different direction.

Drawings were exhibited of *Amœba quadrilineata*, Carter, a common species in the waters in the vicinity of Philadelphia. It is about $\frac{1}{15}$th mm. in length by $\frac{1}{40}$th mm. in breadth. The species is remarkable especially for the retention of the four delicate longitudinal folds in all its movements.

Drawings of two other species of *Amœba* were exhibited, which are supposed to differ from those previously described. They were characterized as follows:—

AMŒBA VIRIDIS.—Bright green from the multitude of contained chlorophyl balls. Form of body irregularly stellate, with thick conical pseudopods projecting in all directions. Sarcodic substance colorless and finely granular. Neither nucleus nor vacuoles were observable. Movements slow. The body occupied a space of about $\frac{1}{10}$th mm. The chlorophyl grains are nearly of uniform diameter and measure the $\frac{1}{250}$th mm. Absecom Pond, New Jersey, Nov. 5, 1874.

AMŒBA TENTACULATA.—Body spheroidal, oval, or limaciform, projecting a multitude of long, conical, or fusiform pseudopods of clear ectosarc, into which no granules of the entosarc enter; pos-

teriorly finely papillate, or with a discoid papillate subdivision Exterior of the body colorless and transparent; interior of the body, or entosarc, yellowish, and spotted brown or green from the food contents. When moving the animal resembles a sea-slug, Eolis, in its shape and from its many long pointed pseudopods. At the fore part of the body, in progression, a large extent of perfectly clear ectosarc precedes the entosarc, equal to about one-sixth the length of the body. This is blunt in front, and with its divergent pseudopods resembles the head of a slug. When floating the animal looks like a large *Actinophrys* with thick conical rays. The animal is voracious, and feeds on desmids, diatomes, and diffuse granular and flocculent vegetable matter. Length of the body from $\frac{1}{3}$th to $\frac{1}{4}$th mm; breadth $\frac{1}{17}$th to $\frac{1}{8}$th mm. The pseudopods up to $\frac{1}{15}$th mm. long by $\frac{1}{125}$th mm. thick. Absecom Pond, New Jersey. Frequent from September to November.

On Supposed Spermaries in Amœba.—Prof. LEIDY stated that in an examination of a large *Amœba*, from Absecom Pond, N. J., he had observed a point of structure which he had not previously noticed in any of the species. The *Amœba* generally assumed a globular or oval form from the $\frac{1}{70}$ to the $\frac{1}{8}$ of a line in diameter. It projected from any part of its circumference digitiform pseudopods up to $\frac{1}{24}$ of a line by the $\frac{1}{180}$ of a line thick. The granular matter of the entosarc was mingled with a multitude of brown food balls, and numerous crystals, most of which appeared to be of isometric forms. The coarser granules of the entosarc rarely entered even the base of the pseudopods.

The uniformly granular nucleus, immersed in the entosarc, measured about $\frac{1}{40}$ of a line in diameter. The contractile vesicle measured $\frac{1}{22}$ of a line. With a $\frac{1}{70}$ immersion objective lens, there were observed around the circumference of the contractile vesicle, half-a-dozen granulated spheres, from $\frac{1}{120}$ to $\frac{1}{8}$ of a line in diameter. The granules of these spheres appeared to be of uniform size, and exhibited an active swarming movement, resembling the motion of spermatozoids. I could not isolate the spheres to examine them more definitely, nor could I detect the ordinary spermatozoid form among the closely swarming granules. I have suspected that these granular spheres were spermaries? After having detected them with the $\frac{1}{70}$ objective lens, I could barely see them with the $\frac{1}{8}$ objective.

On the Geology of Certain Lands in Ritchie and Tyler Counties, W. Va.—Prof. PERSIFOR FRAZER, Jr., asked the attention of the meeting while he described, as follows, the geological features of two tracts of land in Ritchie and Tyler Counties, W. Va., belonging to the Academy, and which he had recently been requested to examine as an expert. The tract in Ritchie County *exclusively* comprises a tolerably regular parallelogram, whose sides run north-

east and northwest, and whose area includes about seventeen hundred and eighty-seven acres, divided into unequal parts, both by the Hughes River and by the Baltimore and Ohio Railroad. The north angle of the property is distant about half a mile from the station of Cornwallis on the above railroad.

The lands themselves resemble in general character thousands of square miles of territory both in West Virginia and Pennsylvania, which are situated in the coal measures. They may be described as very thick deposits of sandstone and shale through whose almost horizontal strata the numerous small streams have cut precipitous ravines to a depth of three hundred and fifty or four hundred feet. The soil, which is what is known in that part of the country as "white sand soil," is generally light and poor, and, except in the alluvial bottoms, unsuited to the production of fine cereal crops.

These hills and plateaus are covered with forest vegetation of different kinds, the most abundant representatives of which are white, red, and black oak, chestnut oak, poplar, beech, hickory and ash, white and yellow pine. Locust is almost unknown on the tract near Harrisville, though frequently met with in the northern part of the county. The greatest value of the land is for its production of white oak and poplar, especially the former, which is cut into railroad ties and barrel staves.

Both the Harrisville and the Tyler County tracts are situated upon the so-called coal measures of West Virginia, and the former of these is about ten to fifteen miles east of the town of Petroleum. So far as the mineral resources of this property (the Harrisville tract) are concerned, the excitement which a few years ago was allayed after an enormous expenditure of money in futile efforts to procure oil in the district embracing Ellenboro', Harrisville, and Cornwallis, furnishes us with the means of making a very fair estimate of them. Nothing but oil, coal, iron ore, or clay is to be anticipated, and the very numerous bore-holes sunk to procure the first of these presents us with seven hundred and fifty feet of measures, in no horizon of which is there a workable bed of coal. The formation, with its plates of sandstone and shale, is almost horizontal, and rolls gently east and west with a dip of 2° or less; and though different sections of these hills varied the order of recurrence of their sandstone, flags, and shale, the position of the only coal seam found was constant, and near the beds of the streams. The coal bed was opened along a small run entering the south corner of the Harrisville tract in several places. In order to ascertain the true position of this deposit with reference to the rocks on the property which lie about one-quarter of a mile northwest of the largest opening, a line was run connecting together the south corner of the tract, the bore-hole, and this opening. This line was only a rough approximation to the truth, the distances being obtained by pacing, and the altitudes by the eye,

but it was clearly evident that the coal underlay the whole tract where it had not been washed out by the streams. I could obtain no exact information as to its value nor even a fair sample of it, the excavations having been nearly filled with dirt. If this bed should prove to be the same as that opened near Ellenboro', it will probably average from fourteen inches to eighteen inches in thickness and may be of good quality, but cannot for many years add any great value to the lands under which it occurs. This is the only coal of which anything is known, although the bore-hole of which I am about to speak developed a bed of black slates at a much lower level.

The bore-hole alluded to was sunk by Mr. Moats, and lies about three hundred feet inside the southeast property line, and about thirty feet north of the road. The record of this exploitation was, as usual, not kept, and the account which follows, taken entirely from remembrance of the alternation of strata, must be accepted with great allowance, and is rather valuable as indicating what was *not* found than for any positive results ascertained.

Shales and loose stuff (?)	50 feet.
Very hard white rock "like marble" without grain, only got through three or four inches in a day . . .	4 "
Sand rock, black slates, sand rock and fire clay . .	? "
"Soap stone" (*i. e.* soft slaty rock)	8–10 "

Beneath the black shales occurred a sand rock of which there were three in all.

At three hundred feet enough oil was reached to see and smell, and it seemed of good quality.

Starting from a station high up the hill at the southern corner of the property, a rough section gave:—

? covered with debris	70 feet.
Reddish-gray sandstone ? feet ? ? " }	70 "
Greenish sand rock ? " ? ? " }	80 "
Massive plate of sandstone	30 "

Flat sandstone in bed of creek.

This brings the rocks down to about the level of the bore-hole, and renders it probable that the first fifty feet through which the hole was sunk included the first sand rock.

It will be remarked that in the section here described no place is given to the eighteen-inch coal bed, which occurs a little higher up the run. Its position is to be looked for in the fifty feet through which Mr. Moats first passed. He may not have noticed it; or he may have forgotten it; or (which is very probable) these fifty feet below the general level of the bank of the run may consist of loose debris which the stream has torn out and scattered along its course where the soft coal would have disappeared.

It would be disloyal to science to hazard an opinion on the true horizon of these measures without the most careful instrumental

work, and a thorough comparison of the labors of the Pennsylvania and Ohio geologists, as well as the more recent sections of Stevenson and White.

It has been stated that the measures are almost horizontal, having a dip of about 2° or less from low axes, which are generally north and south. Mr. I. C. White, in his preliminary introduction to his "Notes on the Upper Coal Measures of Western Virginia and Pennsylvania," read before the Lyceum of Natural History of New York, and reprinted from their *Annals*, speaks of the "Dividing Ridge" as a watershed between the tributaries of the Monongahela and those of the Ohio, which occupies the median line of a gentle anticlinal axis which passes across the coal measures from north to south.

There are, without doubt, many of these gentle north and south axes in the southwestern coal measures—at least in Tyler, Ritchie, and Pleasant Counties, and one of them on the western limits of the Academy's Harrisville tract sheds the oil as well as the water.

Geologically there seems to be no reason to expect any great development of mineral resources.

Tyler County Tract.—During the entire time occupied by the examination of the lands of the Academy, extensive forest fires prevailed, and the whole region was densely clouded with smoke, which not only made it impossible to get any extended view of the country, but so completely obscured the sun that at 3 P.M. it was not possible to indicate its position in the sky. This smoke shortened the day and prevented me from visiting certain tracts where the fires were prevailing.

The so-called Tyler County tract lies across the border of Tyler and Ritchie Counties, from the headwaters of the largest tributary to McKim Creek, across the "Dry Ridge" to the banks of Hughes River. It contains more bottom and, therefore, more arable land than the Harrisville tract, and what parts have not been settled on contain an abundance of fine timber.

What I have said of the structure of the Harrisville tract applies largely to that of the Tyler County tract, though the poverty of the country in coal in the latter must be assumed on different grounds from that of the former, where numerous borings made in the search after oil served to show the absence of coal within a reasonable distance below the surface; while *here* there are no such exploitations.

About three miles south-southwest of the lower corner of the Tyler-Ritchie tract, on the property of Mr. Campbell I discovered a thin bed of coal, which, from what I could learn, agreed in general description with the thin seam opened in the base of the hills near Ellenboro'. It would be rash to generalize, from a hurried observation of a bed beneath the surface of a run, a continuity with the Ellenboro' bed eight miles distant, but so far as I could carry the measures southward by a rapid transit over them, they

bore out the identity. If this be truly the same thin seam which crops out near Ellenboro', and which I have supposed to be the same as that on Mr. Moat's farm, there is no difficulty in prophesying an absence of coal and oil from these Tyler County lands. If the seams are not the same the structure must be so complicated as to need a special study. The chances, however, are very much against the existence of valuable mineral deposits on the Tyler-Ritchie tract.

Prof. Lesley remarked that he had not had an opportunity to speak with Prof. Frazer before the presentation of his report, but that he had seen Mr. Stevenson lately, who informed him of a very important observation which he had made in the region of the Harrisville tract.

Mr. Stevenson had satisfied himself of the existence of a fault on the Hughes River which brought up the lower measures horizontally against the middle barren group of coal measures which lay westward of them.

Prof. Lesley regretted the absence of Mr. Stevenson, who could of course much better explain his own views on this subject, but he believed that this fact had a most important bearing on the geology of the whole region.

Prof. Frazer asked how the horizontal structure of this faulted district could be satisfactorily accounted for; to which Prof. Lesley replied that it would necessitate the supposition of a vertical drop of the region west of a north and south line of fracture parallel to, and perhaps synonymous with, the "Oil Break" anticlinal, which is only a few miles further west.

In reply to a question as to his opinion of the probability of the sandstone of the downthrown region being the representation of the Mahoning sandstone, Prof. Lesley said that he understood Prof. Stevenson to hold that opinion.

The Committees to which they had been referred recommended the following papers to be published:—

SYNOPSIS[1] OF THE MURIDÆ OF NORTH AMERICA.

BY DR. ELLIOTT COUES, U.S.A.

Family MURIDÆ.

Taken in its current acceptation, but with exclusion of the genus *Jaculus*, which differs sufficiently in dentition, in the character of the anteorbital foramen, proportions of limbs, and other features.

$$\text{I.}\,\frac{1-1}{1-1};\ \text{C.}\,\frac{0-0}{0-0};\ \text{P.}\,\frac{0-0}{0-0};\ \text{M.}\,\frac{3-3}{3-3}=\frac{4-4}{4-4}=\frac{8}{8}=16\ \text{teeth.}$$

Anteorbital foramen a large pyriform slit, bounded exteriorly by a broad plate of the maxillary.

Subfamily MURINÆ.

Molars rooted, tubercular, with crenate periphery. Root of under incisor causing protuberance on outside of jaw, at or near notch between condyle and coronoid process. Descending process of mandible a broad flattened plate, wholly below plane of the molars. Anterior root of zygoma deeply nicked at the anteorbital foramen. Palate nearly plane.

Murine Series.

Molars with three tubercles in transverse series. Soles naked. (Only indigenous in the Old World—introduced in the New.)

Genus I. **MUS**, Linn., emend.

1. **Mus decumanus.**
2. **Mus alexandrinus.**
3. **Mus rattus.**
4. **Mus musculus.**

[1] Abstract of a memoir in which the characters of the varieties, species, and higher groups are treated in full, with synonymy, bibliography, etc., and the argument for the views advanced. Based on the material (several thousand specimens) in the Museum of the Smithsonian Institution.

Sigmodont Series.

Molars with two tubercles in transverse series. Soles normally[1] hairy. (New World rats and mice.)

Genus II. **NEOTOMA**, Say and Ord.

Syn. *Mus*, sp., Say and Ord, 1818; Desm., 1822.—*Arvicola*, sp., Harlan, 1825.—*Lemmus*, sp., Fisch., 1829.—*Neotoma*, Say and Ord, J. A. N. S. P. iv. 1825, 346, and of authors; type, *N. floridana*.—*Myoxus*, sp., Rich., Zool. Journ. iii. 1828, 517 (*N. cinerea*).—*Teonoma!* J. E. Gray (same type).

Obs. Embracing sigmodont rats of North and Middle America, of the largest size, highly murine in general aspect. None so small as the largest of the other N. American species. There are abundant cranial and external generic characters. Only here we find in one species a bushy distichous tail, almost as in *Sciurus*—a circumstance which doubtless caused the reference of the species to *Myoxus*; but other species of the genus do not show this feature.

Analysis of Species.

I. Tail scantily hairy (nearly as in *Mus*).

a. Tail bicolor, barely or not as long as the body without the head. Feet entirely white. Length 9 inches or less; tail 6 or less.
FLORIDANA.

b. Tail unicolor, blackish, about as long as head and body. Feet partly dusky.

a'. Large; about the size and general coloration of *N. floridana*.
FUSCIPES.

b'. Small; length about 7 inches. Coloration rich, warm rusty-red, with snowy white underparts. (Extralimital.)
FERRUGINEA.

II. Tail densely hairy (as in *Myoxus*), bicolor. Size of the first, or larger.
CINEREA.

Obs. In addition to the foregoing, occurs *N. magister*, a fossil species, known only by its skull. It is a probable progenitor of series I., if not of the whole. *N. cinerea* obviously stands apart; the other species still continue more nearly united, though I have not seen exactly intermediate specimens.

[1] Naked in *Sigmodon*, in subgenus *Oryzomys*, and almost so in two species of subgenus *Vesperimus*.

1. **Neotoma magister**, Baird, M. N. A. 1857, 498, in text. Loc. of remains:—Caves in Pennsylvania, near Harrisburg and Carlisle.

2. **Neotoma floridana**, Say and Ord.

Syn. *Mus floridana*, Ord, Bull. Soc. Philom. Phila. 1818, 181.
Arvicola floridana, Harlan, Fn. Amer. 1825, 141.
Neotoma floridana, Say and Ord, J. A. N. S. P. iv. 1825, 352, pl. x. figs. 1, 2, 3, 4.
Lemmus floridanus, Fischer, Syn. 1829, 299.
Neotoma mexicana, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 490; Mex. B. Surv. ii. 1859, 44, pl. 24, f. 1 *a–g*.
Neotoma micropus, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 492; Mex. B. Surv. ii. 1859, 44.

Hab. Southern United States, and Northern Mexico. North to Maryland (*Audubon*), New York (*Bell*), and Massachusetts (*Gibbs*). Illinois, Arkansas, Kansas.

3. **Neotoma fuscipes**, Cooper.

Syn. *Neotoma fuscipes*, Cooper's MSS., Bd., M. N. A. 1857, 495.

Hab. California.

[3 *bis*. Extralimital: **Neotoma ferruginea**, Tomes.]

Syn. *Neotoma ferruginea*, Tomes, P. Z. S. 1861, 281.

Hab. Guatemala. Tehuantepec (*Sumichrast*).

4. **Neotoma cinerea**, (Ord) Baird.

Syn. *Mus cinereus*, Ord, Guthrie's Geog., 2d Am. ed., ii. 1815, 292 (based on *ash-colored rat with hairy tail of the Rocky Mts.*, Lewis and Clarke, *passim*).
Neotoma cinerea, Bd., M. N. A. 1857, 499, pl. liii. f. 4.
Myoxus drummondii, Rich., Zool. Journ. iii. 1828, 517.
Neotoma drummondii, Rich., F. B. A. i. 1829, 137, pl. viii.
Neotoma occidentalis, Cooper's MSS., Bd., P. A. N. S. P. vii. 1855, 335; M. N. A. 1857, 496, pl. liii. f. 3.

Hab. Western and Northwestern North America, to the Pacific. East to Nebraska, Colorado, etc., and in British America to Hudson's Bay. South to New Mexico and California.

Genus III. SIGMODON, Say and Ord.

Syn. *Sigmodon*, Say and Ord, J. A. N. S. P. iv. 1825, 352. *Arvicola*, sp., Aud. and Bach., Harlan, Godman.—*Hesperomys* (subg. *Deilemys*), De Saussure, R. & M. Z. 1860 (type *toltecus*).

Obs. Very closely related to the average sigmodont mice. Larger than usual; pelage hispid; soles naked, granular; hind

feet very long. 1st and 5th toes subequal and very short; fore-feet not half as long as the hind. Tail nearly naked. Dental and cranial characters slight. I can find but one species.

1. **Sigmodon hispidus, Say and Ord.**

SYN. *Sigmodon hispidum*, Say and Ord, J. A. N. S. P. iv. 1825, 354, pl. x. f. 5, 6, 7, 8; and of authors.
Arvicola hispidus, Godm., Am. Nat. Hist. ii. 1826, 68.
Arvicola hortensis, Harlan, Fn. Amer. 1825, 138.
Arvicola ferrugineus, Harl., Am. Journ. Sc. x. 1826, 285 (rusty var.).
Arvicola texiana, Aud. and Bach., Q. N. A. iii. 1853, 229, pl. cxlvii. fig. 2 (not A. texiana, *Id.*, *ibid.* 319, which is *Hesperomys leucopus*).
Sigmodon berlandieri, Bd., P. A. N. S. P. vii. 1855, 333; M. N. A. 1857, 504; Mex. B. Surv. ii. 1859, 44, pl. vi. f. 2, 2a (Texas and Mexico).—Tomes, P. Z. S. 1861, 281 (Guatemala).
Hesperomys (*Deilemys*) *toltecus*, De Saussure, R. & M. Z. 1860. p. —, pl. ix. f. 3a (Vera Cruz).

Hab. Southern United States and Mexico, especially coastwise. South to Guatemala.

Obs. Occupying a considerable stretch of country that affords very different climatic conditions, this species changes insensibly from reddish-brown lined with black, beneath whitish, tail rarely equalling the body alone, and hind foot not over 1.30 or under 1.10 (typical *hispidus*), to a grayer brown, with purer white under parts, tail sometimes equalling body and head, hind foot sometimes 1.37 ("*berlandieri*"); and this to an animal like the first in colors and proportionate length of tail, but the hind foot not over 1.10, sometimes only 0.95 ("*toltecus*").

Genus IV. HESPEROMYS,[1] Waterh., emend.

SYN. *Mus*, sp., Aud.—*Arvicola*, sp., Harl., Am. Monthly Journ. 1832, 446 (*nuttalli*); Aud. & Bach., Q. N. A. (*sonoriensis* Le C., *texana*, Woodh., and *oryzivora*, Aud. and Bach.).—*Hypudæus*, sp., Maxim.,

[1] In proposing *Hesperomys*, Waterhouse obviously intended only to separate the New World mice collectively from those of the Old World, on the difference in the dentition. This is evident throughout his article in the Voyage of the Beagle. Though treating only of South American species, he is at pains to say in one place that "*Mus leucopus*, *Neotoma* and *Sigmodon* certainly belong to the same group." As instituted, *Hesperomys* is precisely coequal with the tribe or series *Sigmodontes* as contrasted with typical Old World *Mures*. It includes in South America, *Calomys* (*Eligmodontia*, F. Cuv.), *Habrothrix*, *Phyllotis*, *Scapteromys*, *Oxymicterus*, *Holocheilus*, and *Reithrodon*; in North America, the "*Hesperomys*" of our authors, *Onychomys*, *Oryzomys*, "*Reithrodon*" of our authors, *Sigmodon*

Reise, ii. 1841, 99 (*leucogaster*).—*Musculus*, Raf., Am. Monthly Mag. iii. 1818, 446 (*leucopus*).—*Hesperomys*, Waterh., Zool. Voy. Beag. 1839, 75 (established for the New World mice collectively, and therefore equivalent to the tribe *Sigmodontes* as now understood).—*Calomys*, Aud. and Bach., Q. N. A. ii. 1851, 303 (*aureolus*).—*Onychomys*, Bd., M. N. A. 1857, 458 (*leucogaster*, Maxim.).—*Oryzomys*, Bd. *op. et loc. cit.* (*palustris* Harl.).

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and *Neotoma*. Naturalists soon perceived the supergeneric value of this assemblage, and sought to eliminate various groups under other generic appellations. Waterhouse himself established a number of divisions which, with some modifications, have been generally accepted. In North America, *Sigmodon* and *Neotoma*, with the so-called "*Reithrodon*," stand well apart from *Hesperomys*; in South America, *Holocheilus* and the true *Reithrodon* seem perfectly distinct. The rest of the American mice (at least so far as I know them) most probably fall under a restricted genus *Hesperomys;* we have only to tie this name down to the strict value of a genus, pin it to its type, and establish among the numerous species what subgeneric divisions we can. From the circumstances of its founding it is difficult to say what should be considered the type of *Hesperomys*. Waterhouse, in drawing his comparisons between *Mus* and the New World mice, took *M. rattus* and *M. bimaculatus* for such purpose; we may properly therefore elect the latter as technically the type. But when Waterhouse, in 1837, established *Calomys* upon *C. elegans*, he included in it both *bimaculatus* and *gracilipes;* and *Eligmodontia* of F. Cuvier is strictly coequal. It becomes a question whether one of these names should not stand in place of *Hesperomys* as restricted; but as the latter is firmly established, as *Calomys* is by the same author, and as *Eligmodontia* is no earlier, there may be no necessity for a change. Resting then upon this strict application of *Hesperomys* to such species as *bimaculatus*, *elegans*. and *gracilipes*, we may inquire how nearly, if at all, the North American Vesper-mice agree with it. In his essay of 1857, Prof. Baird elaborately details the characters of the South American species, and, excluding *Reithrodon* and *Holocheilus* as full genera, makes *Hesperomys* to include three subgenera, viz., *Calomys* Waterh., *Habrothrix* (=*Habrothrix plus Phyllotis*, Waterh.) and *Oxymicterus* (=*Oxymicterus plus Scapteromys*, Waterh.). Among North American forms, he establishes three subgenera, *Hesperomys*, *Onychomys*, and *Oryzomys*. I confirm these last unequivocally; the only point being whether the *leucopus* group, which Baird left in *Hesperomys*, is not also a group subgenerically different from that including *elegans*, *bimaculatus*, etc. All the North American mice seem to be differentiated from those of South America by characters of more than specific importance; the closest approach that I am aware of being found in the *leucopus* group, a species of which—*nuttalli*, yellowish underneath—comes near *Calomys*.

I propose to retain *Hesperomys* for all the North as well as certain South American species, and to divide the former into three subgenera; *Vesperimus*, Mihi, *Onychomys*, Baird, and *Oryzomys*, Baird.

Subgenus VESPERIMUS, Coues.

SYN. *Musculus*, Raf., Am. Month. Mag. iii. 1818, 446 (used in connection with *leucopus*, but ineligible for obvious reasons.)—*Hesperomys*, Baird (with exclusion of *Onychomys* and *Oryzomys*).—*Calomys*, Aud. and Bach. Q. N. A. ii. 1851, 303 (type *aureolus*; not of Waterhouse).

Char. Teeth strictly sigmodont. Back upper border of orbit not beaded (compare *Onychomys* and *Oryzomys*). Coronoid not attaining level of condyle. Cranial and dental characters in general strictly those of *Hesperomys*. Small but well-developed cheek-pouches! Of medium and small size, lithe form and quick movement. Eyes large, prominent. Snout pointed. Ears large, rounded, thin, scantily and finely pilous; antitragus evident but not valvular. Fore feet hardly or not half as long as the hinder; palms naked; fore claws not larger than the hinder; digits slender, 3d and 4th subequal and longest, 2d and 5th successively much shorter. Hind feet long, slender; soles 6-tuberculate, naked or scant-furred on the posterior third; 2d, 3d, and 4th subequal and much the longest, 5th shorter; 1st shortest. Tail terete, slender, closely hairy, ranging in length from as long as body alone to a little longer than head and body. Pelage soft, close, glossy, with but few longer bristly hairs; feet and under parts white or whitish; body and tail more or less distinctly bicolor. No woolly tufts of hair about the ears. Type, *V. leucopus*. (Compare diagnoses of *Onychomys* and *Oryzomys*.)

Obs. Among the multitude of species of this group ascribed to North America, I can recognize as distinct but the few following, having proven to my entire satisfaction the complete intergradation of the others.

1. **Hesperomys (Vesperimus) leucopus, (Raf.) Le Conte.**

SYN. *American Field Mouse or Rat*, Penn., Syn. 1771, No. 303; Hist. Quad. 1781, No. 302; Arct. Zool. i. 1784, 131.

American Wandering Mouse, Barton, Med. and Surg. Journ. Phila. i. 1805, p. 81.

Mus sylvaticus, var., Erxl., Syst. Av. i. 1775, 390 (based on "New York var." of Pennant).

Mus sylvaticus, var. *noveboracensis*, Fisch., Syn. 1829, 318 (the same).

Mus noveboracensis, Selys-Longch., Études Microm. 1839, 67.

Mus agrarius, var. *americanus*, Kerr's Linn. 1792, 231 (based on Pennant).

Mus agrarius, Godman, Am. Nat. Hist. i. 3d ed. 1860, 316 (also in the earlier editions).

Cricetus myoides, Gapper, Zool. Journ. v. 1830, 204, pl. 10 (Canada).

Hesperomys myoides, Baird, M. N. A. 1857, 472 (Vermont, based on Gapper[1]).

Arvicola emmonsii, DeKay, Rep. Quad. Mass. 1840, 61.

Musculus leucopus, Raf., Amer. Month. Mag. iii. 1818, 446.

Mus leucopus, Desm., Mamm. ii. 1822, 307; and of authors.

Hesperomys leucopus, Le C., P. A. N. S. P. vi. 1852, 413, and of authors.

Hesperomys maniculatus, Wagn., Wieg. Arch. ii. 1843, 141, and ii. 1845, 148; Abh. Akad. Wissen., v. 1848, 316 (Labrador).

Hesperomys polionotus, Wagn., Wieg. Arch. ii. 1843, 52 (Georgia).

Hesperomys campestris, Le C., P. A. N. S. P. vi. 1853, 413 (New Jersey).

Hespermys texanus, Woodh., P. A. N. S. P. vi. 1853, 242 (Texas).

Hesperomys cognatus, Le C., P. A. N. S. P. vii. 1855, 442 (Southern States).

Hesperomys gracilis, Le C., P. A. N. S. P. vii. 1855, 442 (Northwest States).

Hesperomys austerus, Bd., P. A. N. S. P. vii. 1855, 336 (Washington Territory).

Hesperomys boylii, Bd., P. A. N. S. P. vii. 1855, 335 (California).

Hesperomys gambeli, Bd., M. N. A. 1857, 464 (Pacific Coast, U. S.).

?Hesperomys indianus, Maxim., Arch. f. Naturg. xviii. 1862, 111 (*fide Allen*).

[*Note.*—The above synonymy is exclusive of the several geographical varieties of this species which may be recognized.]

Hab. North America generally.

1*a*. **Hesperomys (Vesperimus) leucopus gossypinus** (Le C.).

SYN. *Hesperomys gossypinus*, Le Conte, P. A. N. S. P. vi. 1853, 411 (Georgia).

Hypudæus gossypinus, Le C., McMurtrie's Cuvier, i. 434, App.

Hab. South Atlantic States.

1*b*. **Hesperomys (Vesperimus) leucopus sonoriensis** (Le C.).

SYN. *? Mus leucopus*, Rich., Zool. Journ. iii. 1818, and F. B. A. i. 1829, 142.

Hesperomys sonoriensis, Le C., P. A. N. S. P. vi. 1853, 413 (Sonora).

Hesperomys sonoriensis, var. *nebrascensis*, Bd. M. N. A. 462, in text.

Hab. Interior of North America, west of the Mississippi, from Arctic Regions to Mexico (usually occupying this range to the

[1] The presence of cheek pouches, supposed to remarkably distinguish this animal, I have determined in *all* the species of *Vesperimus* examined. It is an interesting question whether they also occur in South American forms.

exclusion of typical *leucopus*, but associated with it in some localities).

1c. **Hesperomys (Vesperimus) leucopus eremicus (Bd.).**

SYN. *Hesperomys eremicus*, Bd. M. N. A. 1857, 479.—Coues, Quad. of Arizona, Am. Nat. i. 398.

Hab. Valleys of the Colorado and Gila Rivers.

Obs. The soles in this variety, and in species No. 4, are quite naked, but merely as an incident of their desert habitat.

2. **Hesperomys (Vesperimus) aureolus, (Aud. & Bach.) Wagn.**

SYN. *Mus (Calomys) aureolus*, Aud. & Bach., J. A. N. S. P. vi. 1842, 302; Q. N. A. ii. 1851, 303, pl. 95.

Hesperomys aureolus, Wagn., Wieg. Arch. ii. 1843, 51.

? Arvicola nuttalli, Harlan, Am. Month. Journ. 1832, 446; Med. and Phys. Res. 1835, 55, pl. 00.

Hesperomys nuttalli, Baird, M. N. A. 1857, 467.

Hab. Central and Southern States.

3. **Hesperomys (Vesperimus) michiganensis, (Aud. & Bach.) Wagn.**

SYN. *Mus michiganensis*, Aud. & Bach. J. A. N. S. Phila. viii. 1842, 304; Quad. N. A. iii. 1854, 326.

Hesperomys michiganensis, Wagn., Wieg. Arch. ii. 1843, 51.

Mus bairdii, Hoy & Kenn., U. S. Patent Office Rep. Agric. for 1856, (1857) 92, pl. xi.

Hab. Upper Mississippi Valley, especially Illinois, Michigan, and Wisconsin.

4. **Hesperomys (Vesperimus) californicus, (Gambel) Baird.**

SYN. *Mus californicus*, Gamb., P. A. N. S. P. iv. 1848, 78 (Monterey).

Hesperomys californicus, Baird, M. N. A. 1857, 478.

Hesperomys parasiticus, Cooper's MSS., Bd., op. cit. 479 (in text).

Hab. Southern and Lower California.

5. **Hesperomys (Vesperimus[1]) aztecus, De Sauss.**

SYN. *Hesperomys aztecus*, De Sauss., R. M. Z. 1860, p. 00 (p. 22 of the reprint).

Hab. "Mexico." Cape St. Lucas.

Obs. This species appears to belong strictly to the *Vesperimus* group. It is about the size and form of *V. leucopus*, but the tail is nearly naked and scarcely bicolor, while the colors are notably different; they differ just as those of *Neotoma ferruginea* do from

[1] I have not determined the presence of cheek pouches in this or the succeeding species; in all other respects they are truly *Vesperimus*, and they doubtless possess them.

those of *N. floridana*, in rich rusty-red on the sides and partly dusky metatarsus.

To the foregoing list I append the description of an apparently new species of this group:—

6. **Hesperomys (Vesperimus) melanophrys**, Coues, n. s.

Syn. ? ? *Hesperomys mexicanus*, De Sauss., R. M. Z. 1860, p. 00 (p. 20 of reprint), pl. ix. figs. 1, 1*a*.

Descr. from No. 10,183, Mus. Smiths., Sta. Efigenia, *Sumichrast*. General aspect of a species of the *leucopus* group. Large; nose to eye 0.62 (inches and hundredths), to ear 1.12, to occiput 1.40, to tail 4.15; tail 5.00; fore foot 0.42; hind foot 1.04; ear 0.78 above notch. Tail a little longer than head and body, slender, scant-haired. Absolute and relative proportions of feet and digits as in *V. leucopus*; soles hairy on posterior third. Ears large, leafy, apparently naked, really closely pilous. Whiskers reaching to or beyond the shoulder. Skull strictly as in *V. leucopus* (palate ending opposite last molars, not far behind it as in *Mus*, *Oryzomys*, etc.), but not quite so thin and papery, and developing a slight bead on the orbital border, as in the stouter mice generally. Color above giving the general impression of a *gray* mouse, rather than a red mouse with darker dorsal area as in *leucopus* and *aztecus*. It is gray, brightened with fulvous, slightly darker along the back, more decidedly fulvous laterally, and everywhere with a peculiar slight glaucous or hoary shade. Head noticeably purer gray; *eye encircled with a black ring in marked contrast*, the edges of the lids, and a little anteocular spot, being jet black. (This suggests the specific name; I have seen nothing like it elsewhere.) Color below, pure white, the plumbeous roots of the hairs, however, giving a slight grayish cast. Line of demarcation of this white with the color of the upper parts everywhere abrupt. Outside of fore leg colored to the very wrist, but back of the hand white. Hind leg also colored to and *a little beyond* the ankle, forming a definite dark spot on the base of the metatarsus, the remaining five-sixths of the foot being pure white. Tail above, like the back; below, gray—not white; and the line of demarcation, though evident, not sharp. No yellowish or fulvous tinge anywhere on the under parts ("*mexicanus*" of De Saussure is said to be yellowish on the chin and breast). Skull 1.20 long by 0.64 broad.

Obs. This may just possibly be *H. mexicanus* of De Saussure, but I cannot so identify it, and prefer to err on the safe side, if at all. Besides the above specimen, I have others from Tehuacan and Tehuantepec. It is nothing like any of the foregoing North American species. A female shows three pair of mammæ—one axillary, two inguinal.

Subgenus ONYCHOMYS, Baird.

SYN. *Hypudæus*, sp., Maxim., Reise, ii. 1841, 99, *nec auct.* *Mus*, sp., Aud. & Bach., Q. N. A. ii. 1851, 327 (*missouriensis*), *Hesperomys* subg. *Onychomys*, Baird, M. N. A. 1857, 458 (type *Hypudæus leucogaster*, Maxim.).

Diag. Skull strictly as in *Hesperomys* (*Vesperimus*), but molars larger with sharper saliencies and re-entrances. Coronoid attaining level of condyle. External form somewhat approaching the arvicoline in stoutness, and in shortness of tail and ears. Tail in type of the genus not one-half the length of the body alone—little if any longer than the head, very thick and tapering to an obtuse point. Ears about as in the arvicoline genus *Evotomys* (*Hypudæus* of Baird). Fore feet very large, $\frac{2}{3}$ to $\frac{1}{2}$ as long as the hinder, with long, little curved, almost fossorial claws, longer than those of the hind feet. Soles quadrituberculate only —densely furry to the tubercles. White beneath, as in typical *Vesperimus*. A strongly differentiated form! To the type of this section (*Hypudæus leucogaster* of Maximilian, afterward *Mus missouriensis* of Audubon) I add a peculiar variety—more probably a second species. The two may be thus distinguished:—

a. Tail much less than half the head and body, scarcely twice the hind foot. Fore foot more than half the hind foot. Ear about 0.50 high. Beneath snow-white; above mouse-brown with darker dorsal area.

LEUCOGASTER.

b. Tail nearly half the head and body, about $2\frac{1}{2}$ times the hind foot. Fore foot only half the hind foot. Ear about 0.75 high; beneath tawny white; above brownish fulvous without darker dorsal area.

(var?) TORRIDUS.

7. **Hesperomys (Onychomys) leucogaster**, (Maxim.) Baird.

SYN. *Hypudæus leucogaster*, Maxim., Reise, ii. 1841, 99 (Fort Clark).
Hesperomys (*Onychomys*) *leucogaster*, Bd., M. N. A. 1857, 480. (Nebraska.)
Mus missouriensis, Aud. & Bach., Q. N. A. ii. 1851, 327, pl. 100. (Fort Union, Montana.)

Hab. Interior of United States, between Mississippi and Rocky Mountains. Upper Missouri. Red River of the North (*Coues*). Wyoming. Kansas. Doubtless of more extended, but as yet unascertained range.

8. **Hesperomys (Onychomys) torridus**, Coues.

Diag. Resembling *O. leucogaster;* tail longer, ears larger, soles less hairy, fore claws weaker. Coloration much more yellowish; no darker dorsal area; snout, feet, and all under parts tawny-white; dusky stripe on top of tail very narrow, not reaching the tip. Length of head and body 3.75; of tail 2.00; of fore foot 0.40; hind foot 0.80; ear about 0.75 above notch. Only two pair (inguinal) of teats discovered. (Type No. 9886, Mus. S. I.)

Hab. Arizona.

Subgenus ORYZOMYS, Baird.

SYN. *Mus*, sp., Harl., Am. Journ. Sci. 1837.—*Hesperomys*, sp., Wagn., Suppl. Schreber, 1843, and authors.—*Arvicola*, Aud. & Bach., Q. N. A. iii. 1853.—*Oryzomys* (subg.), Bd., M. N. A. 1857, 458 (type *Mus palustris*, Harl.).

Char. Orbits beaded. Anteorbital foramen nearly circular above (somewhat as in *Jaculus*) continued slit-wise below, where narrower than in *Vesperimus;* the maxillary plate bounding it not produced into a pointed process (compare *Sigmodon.*) Palate produced behind last molars—a deep pit on either hand. Coronoid attaining level of condyle. Hind legs short, but feet very large, with obliquely set toes (much as in *Fiber*) in evident adaptation to aquatic habits. Soles perfectly naked, granular, with one long, narrow, postero-internal tubercle (as in *Mus*) and five small ones. Toes with evident basal webbing; very unequal in length, the fifth reaching to the penultimate joint of the fourth (compare *Sigmodon*). Fore feet not half as long as the hinder; palms perfectly naked. Ears small, little overtopping the fur, hairy both sides, with a fluffy tuft in the concavity. Nasal pads more evident than in other sections. Tail long, about equalling the head and body, scant haired; the dermal scales and vertebral rings evident. Fur glossy, but coarse and hispid. Larger than any other N. American species of *Hesperomys;* general aspect of *Sigmodon* or even *Mus* proper.

9. Hesperomys (Oryzomys) palustris, (Harlan) Baird.

SYN. *Mus palustris* Harl., Am. Journ. Sci., xxxi. 1837, 386 (New Jersey).
Hesperomys palustris, Wagn., Suppl. Schreber, iii. 1843, 543.
Hesperomys (Oryzomys) palustris, Bd., M. N. A. 1857, 482.
Arvicola oryzivora, Aud. & Bach., Q. N. A. iii. 1853, 214, pl. 144, f. 3.

Hab. South Atlantic and Gulf States, north to New Jersey. Kansas! (*Goss*). Tehuantepec (*Sumichrast*). Jamaica?

Genus IV. **OCHETODON**, Coues, n. g.

SYN. *Mus, sp.*, Aud. & Bach.—*Hesperomys*, sp., Wagner.—*Reithrodon*, Le Conte, P. A. N. S. P. 1853, 413, and Baird, M. N. A. 1857, 447, *but not of Waterhouse.*

Diag. Form murine (general appearance of *Mus musculus*). Size minute. Skull as in *Vesperimus;* coronoid not attaining level of condyle. Tail about as long as head and body. Upper incisors grooved (unique character among N. American *Murinæ*). Front upper molars with four roots instead of three, as in *Hesperomys.*

Obs. The occurrence in North America of sigmodont mice with sulcate incisors was first noticed in 1841 by Audubon and Bachman, who described *Mus humilis.* Their animal was soon referred to *Hesperomys* by Wagner. But the peculiarity of the upper incisors was overlooked until 1853, when Maj. Le Conte took up the point and referred a species to the South American genus *Reithrodon*—a course followed by Prof. Baird in 1857, when the latter described three supposed new species, *R. montanus*, *megalotis*, and *longicauda.* But sulcation of the incisors is almost the only character that *Ochetodon* shares with *Reithrodon;* the two genera are otherwise widely different.[1]

[1] *Reithrodon*, Waterh., P. Z. S. 1837, 29; Zool. Voy. Beag. 1839. Type *R. cuniculoides.*

Diag. Upper incisors sulcate. Rostral portion of the skull large in proportion to the cranial, producing a high, convex forehead; zygomatic width of skull about ⅗ its length; interorbital portion narrow; posterior nares contracted from close approximation of the pterygoids; palate with lateral paired fossæ, and ending nearly opposite or beyond the last molar; incisive foramina very long, extending to or beyond the first molar; coronoid process small and exflected; condylar narrow and very oblique; descending process large, subquadrate, the emargination between this and the condyle deep. Size large; form stout and compact; head broad and arched; eyes large and prominent; ears moderate, pilous; soles hairy behind; lateral toes subequal and extremely short; tail short, about one-half the head and body, moderately hairy.

Analysis of Species of Ochetodon.

A. Tail shorter than head and body (at most barely as long).
Hind feet under 0.70 long (usually 0.55 to 0.65). HUMILIS.
B. Tail longer than head and body.
Hind feet under 0.70 (exceptionally = 0.70). LONGICAUDA.
Hind feet over 0.70 (rarely, if ever = 0.70). MEXICANA.

1. **Ochetodon humilis**, (Aud. and Bach.) Coues.

SYN. *Mus humilis*, Aud. and Bach., P. A. N. S. P. i. 1841, 97; J. A. N. S. P., viii. 1842, 300; Q. N. A., ii. 1851, 103, pl. lxv. (South Atlantic States.)
Hesperomys humilis, Wagner, Wieg. Arch. 1843, 51.
Reithrodon humilis, Bd., M. N. A., 1857, 448.
Mus lecontii, Aud. and Bach., J. A. N. S. P. viii. 1842, 307; Q. N. A. iii. 1854, 324 (no fig.). (South Carolina.)
Hesperomys lecontii, Wagn., Wieg. Arch. 1843, 51.
Reithrodon lecontii, Le C., P. A. N. S. P. vi. 1853, 413.

Most of which is widely different from what obtains in *Ochetodon*, the grooving of the incisors being merely a coincidence. Nor am I satisfied that the three supposed species of *Reithrodon* are strictly congeneric. They differ among themselves in cranial as well as external characters, to an extent at least warranting subgeneric separation. In respects of palatal structure and form of the anterior zygomatic root, there is a curious parallelism with the same points in *Sigmodon* and *Oryzomys*. I will tabulate some of the characters, as follows:—

Reithrodon proper. (Type *R. cuniculoides.*) Anterior root of zygoma deeply emarginated in front. Palate ending much behind the molar series, and showing a median ridge between lateral paired excavations. Pterygoid fossæ deeply excavated, and these bones closely approximated. Incisive foramina reaching beyond the first molars. Condylar process of mandible concave internally; descending process rounded off inferiorly; coronoid process very oblique. Species *R. cuniculoides*, Waterh., P. Z. S. 1837, 30, and Zool. Voy. Beag. 1839, pt. ii. p. 69, pl. xxvi. (animal), pl. xxxiii. figs. 2b, 2c, 2d, 2e (teeth), pl. xxxiv. figs. 2a, 2b, 2c (skull), from Patagonia; and a second supposed species *R. typicus*, Id., P. Z. S. 1837, 30; Voy. Beag. 1839, pt. ii. p. 71, pl. xxxiii. fig. 4a (teeth), from La Plata.

Euneomys, Coues, n. subg. (Type *Reithrodon chinchilloides.*) Anterior root of zygoma nearly straight in front. Palate ending nearly opposite the last molars, but slightly ridged or excavated. Pterygoid fossæ shallow; these bones less approximated. Incisive foramen only reaching to first molars. Condylar process of mandible flat internally; descending process angular; coronoid process nearly vertical. Species *R.* (*E.*) *chinchilloides*, Waterh., Zool. Voy. Beag. 1839, pt. ii. p. 72, pl. xxvii. (animal), pl. xxxiv. figs. 20a, 20b, 20c, 20d, 20e, 20f (skull and teeth), from Straits of Magellan.

? Mus carolinensis, Aud. and Bach., J. A. N. S. P. viii. 1842, 306; Q. N. A. iii. 1854, 332. (South Carolina.)

? Hesperomys carolinensis, Wagn., Wieg. Arch. ii. 1853, 51.

? Reithrodon carolinensis, Bd., M. N. A. 1857, 452.

Reithrodon megalotis, Bd., M. N. A. 1857, 451; Rep. Mex. B. Surv., ii. pt. ii. 1859, p. 43, pl. vii. fig. 4 a–c, pl. xxiv. fig. 4 a–g. (Sonora.)

Hab. United States, southerly. South Carolina to Texas. Kansas. Missouri. Iowa. Nebraska. Utah. Sonora.

2. **Ochetodon longicauda**, (Baird) Coues.

Syn. *Reithrodon longicauda*, Baird, M. N. A. 1857, 451.—? Tomes, P. Z. S. 1861, 284. (Guatemala.)

Hab. California (? south thence to Guatemala).

3. **Ochetodon mexicanus**, (De Sauss.) Coues.

Syn. *Reithrodon mexicanus*, De Sauss., R. and M. Z. 1860, p. — (p. 27 of reprint).—Tomes, P. Z. S. 1861, 284. (Guatemala.)

Hab. Mexico. Guatemala. Louisiana?

4? **Ochetodon montanus**, (Bd.) Coues (sp. proband.)

Syn. *Reithrodon montanus*, Bd., P. A. N. S. P. vii. 1855, 335; M. N. A. 1857, 449, pl. liv. fig. No. 1306 (teeth). (Rocky Mts., lat. 39°.)

5? **Ochetodon sumichrasti**, (De Saus.) Coues. (sp. proband.)

Syn. *Reithrodon sumichrasti*, De Saus., R. M. Z. 1861, 3. (Mexico.) (Unknown to me.)

Subfamily ARVICOLINÆ.

Molars normally rootless, prismatic, with serrate periphery and flat crowns. Root of under incisor causing protuberance on inside of jaw at or near notch between condyle and descending process. Descending process of mandible hamular, attaining level of molars. Coronoid a long stout hook. Anterior root of zygoma not obviously nicked. Palate highly arched.

Genus V. EVOTOMYS, Coues, n. g.

Syn. *Arvicola*, sp., Auct.—*Myodes*, Selys-Lougch., Études de Microm. 1839, 87 (not of Pallas).—*Hypudæus*, Keys. and Blas., Wirbelth. 1842 (type *A. glareola*; not of Illiger, which includes *Mus lemmus*, *amphibius*, etc.).—*Hypudæus* of Baird, M. N. A., 1857, 513, 515, 518 (type *A. gapperi*).—*Evotomys*, Coues (type *Mus rutilus*, Pall.).

Diag. Dentition arvicoline, in flat-topped prismatic molars, but murine in *rooting* of the molars (molars only rooted here among *Arvicolinæ*). Coronoid process of lower jaw not attaining level

of the condyle (unique among *Arvicolinæ*). Bony palate ending in a straight flat shelf opposite middle molars, the whole space between last molars thus left open. General form arvicoline, but ears distinctly overtopping the fur as in *Murinæ*. A strong genus, linking the two subfamilies. There are many peculiarities besides these given.

1. **Evotomys rutilus,** (Pall.) Coues.

Syn. *Mus rutilus*, Pall., N. Sp. Quad. Glir. 1778, 246, pl. xiv. B.
Arvicola gapperi, Dall, Alaska and its Resources, 1870, 577.

Hab. Arctic, circumpolar. Southward in this country this species shades into the following variety:—

1*a*. **Evotomys rutilus,** var. **gapperi,** (Vig.) Coues.

Syn. *Arvicola gapperi*, Vig. Zool. Journ. v. 1830, 204, pl. 9. (Canada.)
Arvicola (*Hypudæus*) *gapperi*, Baird, M. N. A. 1857, 518.
Arvicola fulva, Aud. and Bach., J. A. N. Phil. viii. 1842, 295. (Name preoccupied.)
Arvicola dekayi, Aud. and Bach., Q. N. A. iii. 1854, 287 (same as their *A. fulva* of 1842). Excl. syn. "*oneida* DeKay" which belongs to *A. riparius*.

Hab. Northern frontier of United States, from Atlantic to Pacific, and adjoining belt of British America. South to Massachusetts.

Obs. This species and its variety are distinguished at a glance by the prominent ears and chestnut coloration.

Genus VI. **ARVICOLA,** Lacép., emend.

Syn. *Mus*, sp., Linn., Syst. Nat. i. 1766, *et auct. antiq.*—*Mures cuniculari*, Pall., N. Sp. Glir. 1778, 77.—*Lemmus*, Linck, Fischer, *et al.*—*Myodes*, Pall, Zoog. R. A. i. 1811, 172 (not *Myodes* of Selys-L., 1839, which = *Hypudæus*, Keys.. and Blas. = *Evotomys*, Coues).—*Arvicola*, Lacépède, Tabl. 1803, *et auct. recent.* (includes *amphibius* and *arvalis*).—*Hypudæus*, Ill., Prod. 1811 (not of Keys. and Blas., nor of Baird. Includes *lemmus*, *amphibius* and *arvalis*),—*Myonomes*, Rafinesque, ——— (type "Wilson's Meadow Mouse" = *Arvicola pennsylvanica* of Ord.).—*Psammomys*, Le C., Ann. Lyc. N. Y. 1829, 132 (type *pinetorum;* not of Rueppel).—*Pitymys*, McMurtrie, ed. Cuvier, i. 1831, 434 (type *A. pinetorum*).—*Hemiotomys*, Selys-L., Études, 1839, 85 (*amphibius*, *terrestris*, etc.).—*Microtus*, Selys-L., Études, 1839, 86.—*Pinemys*, Lesson, Nouv. Tabl. R. A. 1842, 12 (type *pinetorum*).—*Hemiotomys*, Bd., M. N. A. 1857, 515 (type *A. riparius*, Ord.).—*Pedomys*, Bd., op. cit. 517 (type *A. austerus*, Le C.).—*Chilotus*, Bd., op. cit. 516 (type *oregonus*, Bach.).

Obs. The limits I would set to *Arvicola* may be gathered from the foregoing, though doubtless some synonyms, and, perhaps, some tenable subgeneric names, of old world forms, have escaped me. Without, therefore, writing out the full diagnosis, I will simply mention characters which separate *Arvicola* as I accept it from the other North American *Arvicolinæ*:—

Molars normally rootless, perennial (*cf. Evotomys*). Folds of enamel fusing at the re-entrances (*cf. Evotomys*). Molars viewed from above about equally serrate on either side (*cf. Myodes, Synaptomys*). Upper molars all subequal in length and breadth (*cf. Myodes, Synaptomys*). Middle lower molar of 4–5 prisms, the last a transverse loop, the rest alternating lateral triangles (*cf. Evotomys*). Back lower molar of not more than 3 prisms seriatim (*cf. Synaptomys, Myodes*), each making a transverse loop. General molar pattern, as to number of prisms to a tooth, as shared by most Arvicolinæ (*cf. Cuniculus*). Upper incisors plane (*cf. Synaptomys*). Roots of under incisors running up the condylar process forming a ridge that only subsides near the notch between condyle and descending process (*cf. Synaptomys, Myodes, Cuniculus*). Palate not ending behind in a flat straight-edged shelf (*cf. Evotomys, Myodes, Cuniculus*). Coronoid process as high as condyle (*cf. Evotomys*). Ears moderately developed (*cf. Myodes, Cuniculus*), but not overtopping the fur (*cf. Evotomys*). Tail longer than foot (*cf. Myodes, Cuniculus*). Fore claws of normal size and growth (*cf. Cuniculus*). The species do not turn white in winter (*cf. Cuniculus*). Many other details could be adduced.

The North American species fall in four sections or subgenera, as established by Baird. I use *Myonomes*, Raf., for the section for which Baird employed *Hemiotomys*, Selys, as none of our sections seem exactly the same as any one of Europe. *Pedomys* and *Pitymys* are like each other in skull and dentition, but offer external peculiarities. The sections may be thus analyzed:—

A. Myonomes. Back upper molar with 2 external triangles and a posterior crescent. Middle upper molar with 2 internal triangles. Front lower molar with 3 internal and 2 or 3 external lateral triangles. Ears unrimmed in front. Soles 6-tuberculate. Fore claws not longer than the hinder ones. Tail about ½ the length of head and body, or more. Pelage ordinary. Size maximum and medium.

B. Chilotus. Back upper molar with only 1 external triangle and a posterior trefoil. Middle upper molar with 1 internal triangle. Front lower molar with 3 internal and 2 or 3 external triangles (as in

Myonomes). Ear with a rim in front of meatus, the anterior and posterior roots of the auricle there meeting. Soles 5-tuberculate (?). Fore claws not larger than the hinder. Tail about ⅓ the head and body. Pelage ordinary. Size minimum.

C. PEDOMYS. Back and middle upper molars as in the last. Front lower molar with only 2 internal and 1 external triangle. Ear unrimmed. Soles 5-tuberculate. Fore claws not larger than the hinder. Tail ⅓ the head and body, or rather less. Pelage ordinary. Size medium.

D. PITYMYS. Molars all as in *Pedomys*. Ears unrimmed. Soles 5-tuberculate. Fore claws larger than the hinder. Tail about ¼ the head and body, or less. Pelage dense, silky, mole-like. Size small.

Subgenus MYONOMES, Raf.

SYN. *Arvicola* of most American writers.—*Arvicola*, A, *Hemiotomys*, Baird, M. N. A. 1857, 515 (type *riparius*. Not of Selys-L.). —*Myonomes*, Raf. ——— (type *M. pratensis*, Raf., based on "Wilson's Meadow Mouse" = *A. pennsylvanica*, Ord. = *A. riparius*, Ord.).

1. **Arvicola (Myonomes) riparius,** Ord.

SYN. *Campagnol or Meadow Mouse of Pennsylvania*, Warden, Descr. U. S., v. 625.

Meadow Mouse, Wils., Am. Orn., vi. pl. 50, f. 3.

Arvicola pennsylvanica, Ord, Guthrie's Geog. 2d Am. ed. ii. 1815, 292 (based on the foregoing).—Harlan, Fn. Amer. 1825, 144 (in part; quotes Ord, but describes *pinetorum*).

Arvicola riparius, Ord, J. A. N. S. P. iv. 1825, 305. (Philadelphia.)

Arvicola riparius longipilis, Kenn., Agric. Rep. U. S. Patent Office, 1856, 304. (West Northfield, Ill.; in winter pelage.)

Arvicola xanthognatha, Harlan, Fn. Amer. 1825, 136 (also of Godman, Say, DeKay, and Linsley, but *not* of Leach nor of Richardson).

Arvicola alborufescens, Emmons, Rep. Quad. Mass. 1840, 60 (albino).

Arvicola hirsutus, Emmons, *l. c.*

Arvicola nasuta, Bachm., J. A. N. S. Phila. viii. 1842, 296. (Massachusetts.)

Arvicola oneida, DeKay, N. Y. Fn. i. 1842, 88, pl. xxiv. f. 1. (New York.)

Arvicola rufescens, DeKay, op. cit. 85, pl. xxii. f. 1. (New York.)

Arvicola occidentalis, Peale, Mamm. U. S. Ex. Ex. 1848, 45. (Puget Sound.)

Arvicola californica, Peale, op. cit. 46. (California.)

Arvicola montana, Peale, op. cit. 44. (California.)

Arvicola edax, Le C., P. A. N. S. P. vi. 1853, 405. (California.)

Arvicola borealis, Le C., op. cit. 407. (Rhode Island.) (Not of Rich.)

Arvicola trowbridgei, Bd., M. N. A. 1857, 529 (in text). (California.)

Arvicola longirostris, Bd., op. cit. 530. (California.)

Arvicola modesta, Bd., op. cit. 535. (Rocky Mts.) (Very young.)
Arvicola rufidorsum, Bd., op. cit. 526. (Mass.) (Reddish specimen.)
Arvicola breweri, Bd., op. cit. 525 (Muskeget, Mass.; bleached insular race).

1*a*. **Arvicola (riparius var.?) borealis**, Rich. ?

SYN. *?Arvicola borealis*, Rich., Zool. Journ. 1828, 517; F. B. A. i. 1829, 127.—Also of Aud. and Bach., and of Baird.

Hab. Northwestern America.

Obs. This and the two succeeding species are presented provisionally.

2. **Arvicola (Myonomes) townsendii, Bach.**

SYN. *Arvicola townsendii*, Bach., J. A. N. S. P., viii. 1839, 63, and of subsequent writers.

Hab. Oregon and Washington Territories.

3. **Arvicola (Myonomes) xanthognathus, Leach.**

SYN. *Arvicola xanthognatha*, Leach, Zool. Misc. i. 1814, 60, pl. 26.—Rich., F. B. A. i. 1829, 123.—Aud. and Bach., Q. N. A. iii. 1853, 67, pl. 125.—Bd., M. N. A. 1857, 552.—Dall, Alaska and its Resources, 1870, 577.—Whether of Sabine? but certainly not of any author treating of United States species.

Hab. British America.

Obs. In its typical condition the animal is unmistakable in its immense size (up to 8 inches long) and chestnut cheeks. There remain, however, some points to be elaborated before the relationship of the several forms of *Myonomes* can be considered established.

Subgenus CHILOTUS, Baird.

SYN. *Chilotus*, Baird, 1857. Type, *A. oregoni*, Bach.

4. **Arvicola (Chilotus) oregonus, Bach.**

SYN. *Arvicola oregoni*, Bach., J. A. N. S. P., viii. 1839, 60.—Aud. and Bach., Q. N. A. iii. 1853, 232, pl. clxvii. f. 3.—Bd., M. N. A., 1857, 537.

Hab. Oregon.

Subgenus PEDOMYS, Baird.

SYN. *Pedomys*, Bd., M. N. A. 851, 517. Type, *A. austerus*, Le C.

5. **Arvicola (Pedomys) austerus, Le C.**

SYN. *Arvicola austerus*, Le C., P. A. N. S. P. vi. 1853, 405. (Wisconsin.)
Arvicola (Pedomys) austerus, Bd., M. N. A. 1857, 532, pl. liv. (Wisconsin and Missouri to Louisiana.)

Arvicola (*Pedomys*) *cinnamoma*, Bd. *op. cit.* 541, pl. liv. (Minnesota.)
Arvicola (*Pedomys*) *haydeni*, Bd., *op. cit.* 543. (Nebraska.)

Hab. Western States and adjoining Territories, especially Illinois, Missouri, and Michigan. Kansas. Louisiana.

5a. Arvicola (Pedomys) austerus, var. curtatus, Cope.

SYN. *Arvicola curtata*, Cope, Pr. A. N. S. Phila. 1868, 2. (Owen's Valley, California.)

Hab. United States, west of the Mississippi. California. Colorado. Kansas and Nebraska, where becoming mixed up with true *austerus*.

Obs. In comparing his supposed new species with "*A. modesta*," Prof. Cope was misinformed as to its affinities. It is a true *Pedomys*, not in the least like any style of *Myonomes*, as I ascertain by inspection of the type specimen. Its extreme modification is peculiar in the small size, and very short tail (less than the head): it shades directly into ordinary *austerus*.

Subgenus PITYMYS, McMurtrie.

SYN. *Psammomys*, Le C., 1829, *nec Rüppel* (type *pinetorum*).—*Pitymys*, McMurt., 1831 (same type).—*Pinemys*, Less, 1831 (same type).

6. Arvicola (Pitymys) pinetorum, Le Conte.

SYN. *Arvicola pennsylvanica*, Harl., Fn. Amer. 1825, 144, in part; the descr. but not the synon. (*not of authors*).
Psammomys pinetorum, Le C., Ann. Lyc. N. Y. iii. 1829, 132, pl. ii.
Pitymys pinetorum, McM., Am. ed. Cuvier, i. 1831, 434.
Pinemys pinetorum, Less., Nouv. Tabl. R. A. 1842, 12.
Arvicola pinetorum, Aud. and Bach., Q. N. A. ii. 1851, 216, pl. lxxx. (excl. syn. "*oneida* DeKay.")
Arvicola (*Pitymys*) *pinetorum*, Bd., M. N. A. 1857, 544.
Arvicola scalopsoides, Aud. and Bach., J. A. N. S. Phila. viii. 1842, 299 (Long Island).
Arvicola apella, Le C., P. A. N. S. P. vi. 1853, 405. (Pennsylvania.)

6a.? Arvicola (Pitymys) pinetorum, var. quasiater, Coues, n. v.

Diag. Subgeneric characters of *Pitymys* (skull not seen), and somewhat resembling *P. pinetorum* (particularly the large dark style formally called *scalopsoides*). Rich glossy blackish, appearing quite black at first sight, but this color warmed into a slight auburn shade by uniform admixture of dusky chestnut or chocolate brown. No markings anywhere; color of the upper parts changing on the sides insensibly into blackish-ash or dark plumbeous of the under parts, which are slightly hoary. Tail like back

above, indistinctly paler below. Fur short, close, of so rich silky lustre that in some lights an appreciable purplish or coppery iridescence is seen. General build of *pinetorum;* rather stouter, larger; nose to eye 0.50; to ear 1.05; to tail 4.33–4.45; tail vertebræ 0.70; with hairs 0.80; height of ear in front 0.45; palm 0.33; sole 0.66.

Hab. Mexico. (Xalapa, *De Oca*, No. 3524, Mus. S. I., type of the species; Tuxpango, *Sumichrast*, No. 7006, Mus. S. I.)

Obs. This peculiar field mouse, which may prove entirely distinct from *pinetorum*, is specially interesting in coming from a region where the genus was long supposed to be not represented. I have never seen any other *Arvicola* from south of the United States, nor is there, to my knowledge, but a single one hitherto described from so low a latitude, on this hemisphere at least. This is *Arvicola* (*Hemiotomys*) *mexicanus*, De Sauss., R. M. Z. 1861, 3, a species apparently allied to *A. riparius.*

Genus VII. SYNAPTOMYS, Baird.

Syn. *Synaptomys*, Bd., M. N. A. 1857, 558, in text under *Myodes*, and p. xliv.

Diag. Superior incisors grooved (unique in the subfamily). Root of inferior incisor ending abruptly opposite last lower molar (the root generally runs up to the condyle in *Arvicolinæ*). Construction of molars, and general cranial characters as in *Myodes.* Palate ending as in typical *Arvicola.* External characters in general of an ordinary arvicoline style, but in the very long soft full pelage, short heavy head, and blunt muzzle, approaching the Lemmings; nevertheless, ears equalling or overtopping the fur as in *Evotomys*, and tail equally or exceeding the hind foot, as usual in *Arvicola.*

Obs. Foregoing are the essential characters of the most remarkable genus of the subfamily, one singularly combining peculiarities of several widely different arvicoline genera. It may be defined in a word as skull and teeth of *Myodes*, in body of *Arvicola*, with ears of *Evotomys*, and *sui generis* sulcation of upper incisors. The genus was happily characterized in 1857, but upon such miserably inadequate material,[1] that Prof. Baird did not formally

[1] No. $\frac{1347}{2150}$, Mus. S. I., merely a rat-eaten bunch of fur, lacking head, tail, and three of the feet, with a defective skull; and No. 1368, skin with feet and tail, but no head, and no skull. Locality unknown, supposed United States. Received from Wm. Cooper.

introduce either genus or species in the body of his work, though in the introductory list he gives *Synaptomys* as a subgenus of *Myodes* and catalogues a species, *S. cooperi*. Though defined with precision, as far as the material would allow, the genus remains little known. I can indorse it unequivocally, and add all details hitherto wanting. There is probably no more strongly marked genus of *Arvicolinæ*.

The groove of the upper incisor is deep, distinct, and runs near the outer edge instead of along the middle (as in *Ochetodon* and *Reithrodon*). The incisors are short, broad, and much curved; their front much bevelled off, so that, viewed in profile, one part of each incisor stands in front of and parallel with the part on the other side of the groove. These teeth tend to the *Myodes* pattern further in being enamel tubes not completely filled with dentine (calling to mind an unfinished quill pen, after the first oblique slice is cut away); their tips are not straightly transverse, and generally nicked at the end of the groove. The under incisors, exactly as in *Myodes*, stop as to their roots abruptly just in front and inside of the last lower molar; while in all other *Arvicolinæ* I have examined, excepting *Myodes* and *Cuniculus*, the root runs past (outside) the lower molar up the ramus of the jaw to near the condyle, this passage of the root making an obvious ridge, here wanting. In *Synaptomys*, as in the genera just mentioned, the whole condylar ramus is thus flat, with its inner surface nearly plane, separated by a strong sulcus from the end of the alveolar portion of the jaw.

As is well known, the molars of *Myodes* (restricted to exclude *Cuniculus*), though essentially aggregated rootless prisms as in other *Arvicolinæ*, are quite different in their details of pattern. Not to go here into detail, I may simply say, that the inner margin of the molar series is *crenate*, not sharply serrate like the outer as in *Arvicola*. Now this pattern of *Myodes* is duplicated in *Synaptomys*, and so is every other molar detail. Incisors aside, the skull and teeth of *Synaptomys* are not distinguishable with certainty from those of *Myodes*. Outside, *Synaptomys* is not a lemming, but an *Arvicola*, one, too, with ears as large as in *Evotomys*. An alcoholic specimen might be mistaken at first sight for *Arvicola austerus*. One might suppose it originally a lemming, stranded in time long past in latitude so low as to impress upon it ordinary arvicoline exterior characters.

Measurements of a skull of *Synaptomys cooperi* (No. 6915, Mus. S. I., Kansas, *B. F. Goss*). Total length (occip. protub. to end of nasals) 1.14; greatest zygomatic width, 0.72; least width (at interorbital constriction) 0.15; width of rostrum, 0.25; intermastoid width 0.58; interparoccipital width 0.37; height opposite and including last molar, without lower jaw, 0.45; length of upper molar series 0.30; length of extra-alveolar portion of upper incisors 0.24; length of rostrum 0.25; tip of under incisors to apex of coronoid 0.62, to back of condyle 0.79, to end of descending process 0.81; length of under molar series 0.28; of extra-alveolar portion of under incisor 0.25.

1. **Synaptomys cooperi, Baird.**

Myodes (Synaptomys) cooperi, Bd., M. N. A. 1857, p. xliv.
Synaptomys cooperi, *op. cit.* 558, in text.
Arvicola (Synaptomys) gossii, Bd., Mus. S. I. (labels of Kansas specimens which, however, are inseparable from the types).

Hab. Middle and Western United States and northward. Brookville, Indiana, *Haymond*. South Illinois, *Kennicott*. Benton Co., Minnesota, *Garrison*. Neosho Falls, Kansas, *Goss*. Skagit Valley, Oregon, *Kennerly*. Nulato, Alaska, *Dall*.

Dimensions (average of several, alcoholic, from Kansas). Nose to eye 0.45; to ear 0.95; to occiput 1.20; to root of tail 3.50 (from 3.00 to 4.00—range of the whole series 2.90 to 4.30); tail vertebræ 0.65 (from 0.51 to 0.75); tail, with hairs, 0.75; fore foot 0.40; hind foot 0.70; ear 0.35.

Eighteen specimens, dry and alcoholic, examined from the above localities.

Genus VIII. MYODES, Pall., emend.

Syn. *Mus*, sp., *et Arvicola*, sp., Auctt. antiq.—*Hypudæus*, Illiger, 1811, *partim* (includes *Mus lemmus, amphibius*, etc.).—*Myodes*, Pall., Zoog. R. A. i. 1811, 172, in part (includes *Arvicola*, and thus about coextensive with his *Mures cuniculorii* of 1778).—*Lemmus*, Linck (fide Bd. In part; includes *Arvicola*.)—*Georychus*, Rich., F. B. A. 1829; and Aud. and Bach., 1854 (includes *Cuniculus*). Not of Illiger, which is of an entirely different family.

Obs. The chars. of this genus should unquestionably be so drawn as to exclude *Cuniculus*, which latter, although also a "lemming," is quite as widely separated as the other genera of *Arvicolinæ* are. Being based upon a long and well-known animal, the

characters need not be here recapitulated. The several ascribed species of North American *Myodes* proper are reducible to the following, which is not specifically separable from that of Asia.

1. **Myodes obensis**, Brantz.

Syn. *Myodes obensis*, Brantz, Muisen, 1827, 55.—Keys. and Blas., Werb. Eur. vi. 1840, pp. vii. and 32. Midd., Sib. Reise, ii. 1853, 99, pl. ii. figs. 7, 8, 9, pl. viii. pl. ix. and pl. x. f. 2.—Baird, M. N. A., 1857, 559.

Arvicola (*Georychus*) *helvolus*, Rich., F. B. A., 1829, 128.

Georychus helvolus, Aud. & Bach., Q. N. A. iii. 1853, 84, pl. cxx. f. 1.

Myodes helvolus, Dall, Alaska and its Res. 1870, 577.

Arvicola (*Georychus*) *trimucronatus*, Rich., App. Parry's 2d Voyage, 1825, 309; F. B. A. i. 1829, 130.

Georychus trimucronatus, Aud. and Bach., Q. N. A. iii. 1833, 86, pl. cxx. f. 2, 3.

Myodes trimucronatus, Dall, Alaska, 1870, 577.

Myodes albogularis, Wagner, Suppl. Schreber, iii. 1843, 602.

Hab. More western portions of Arctic America.

Obs. Of this species I have handled about forty specimens, the first examined by an American naturalist for many years. They differ somewhat from the only two Siberian skins before me, possibly representing a variety (to be called *Myodes helvolus*); but I am far from disputing Von Middendorff's decision as to their specific identity with the Asiatic animal.

Genus IX. **CUNICULUS**, Wagler.

Syn. *Mus*, *Arvicola*, *Myodes et Lemmus*, Auctt.—*Georychus*, *partim*, Rich., Aud. and Bach., *nec Ill.*—*Cuniculus*, Wagler ("1830"), Isis, 1832, 1220; type *C. grœnlandicus* = *C. torquatus* or *hudsonius*.—Lilljeborg, Syst. Ofvers. Gnag. Glires, 1866 (same type).

Obs. Without going into the characters of a perfectly well-known form, I wish to particularly signalize the fact that this genus, though based upon a "lemming," is very different from *Myodes*, and, indeed, from any other arvicoline type. The molar pattern is strongly of an ordinary arvicoline general character—not at all as in *Myodes* or *Synaptomys*—while details of the molar dentition (as, for instance, *six* prisms on back upper molar and *nine* on front lower molar) are unique. The obsolete ear and pollex, the singular hypertrophy of the two middle fore claws, and the notable seasonal changes of pelage, are all peculiar. I find but one American species, identical with that of Asia. A second supposed species, *C. lagurus*, I have not seen.

1. **Cuniculus hudsonius**, (Forst.) Coues.

Syn. *Mus hudsonius*, Forst., Phil. Trans. lxii. 1772, 379.—Pall., N. Sp. Glir. 1778, 201.—Gm., Syst. Nat. i. 1788, 137.
Lemmus hudsonius, Sab., Suppl. Parry's Voy. 1824, 185; App. Franklin's Journ. 1825, 661.—Harl., Fn. Amer. 146.
Arvicola hudsonia, Rich., App. Parry's 2d Voy., 308.
Arvicola (*Georychus*) *hudsonius*, Rich., F. B. A. i. 1829, 132.
Myodes hudsonius, Wagn., Suppl. Schreb. iii. 1843, 604.—Midd., Bull. Acad. St. Petersb. iii. xix. Dall, Alaska, 577.
Georychus hudsonius, Aud. and Bach., Q. N. A. iii. 1853, 81, pl. cxix.
Mus torquatus, Pall., N. Sp. Glir. 1778, pp. 77 and 205, pl. xi. B.
Myodes torquatus, Keys. and Blas. Wirb. Eur. 1840, pp. vi. and 32.—Midd., Sib. Reise, ii. 1853, 87, pl. iv.–vii. and x.—Baird, M. N. A., 1857, 558.
Mus lenensis, Pall., N. Sp. Glir. 1778, 195.
Mus grœnlandicus, Traill, Scoresby's Greenland, 1823, 416.
Arvicola (*Georychus*) *grœnlandicus*, Rich., F. B. A. i. 1829, 134.
Georychus grœnlandicus, Aud. and Bach., Q. N. A. iii. 1854, 315.
Cuniculus grœnlandicus, Wagler, Isis, 1832, 1220.
Myodes grœnlandicus, Wagner, Suppl. Schreber, 1843, 606.
Lemmus ungulatus, Baer, Baer and Helm., Beit. iv. 1841, 283.
Hudson's Rat and Hare-tailed Rat, Penn., Arct. Zool. i. 132, 133; Quad. ii. 201.—*Hare-tailed Mouse*, Hearne, Journ. 387.—*Hudson's Bay Lemming*, Aliq.—*Wapiskooseesick* ("White Bear Mouse") of the Crees, *Lunaguy* ("White Mouse") of the Chippeways, *Aeingnack* ("White Mouse") of the Esquimaux.

Hab. Arctic regions.

Genus X. **FIBER**, Cuvier.

Syn. *Castor*, L., S. N. i. 1766, 78 (not type).—*Mus*, Gm., S. N. i. 1788 (not type).—"*Myocastor*, Kerr's Linn., 1792," partly, (type *Myopotamus coypus*).—*Fiber*, Cuv., Leçons, i. 1800 (type *Castor zibethicus*, L.).—*Lemmus*, Fisher, Syn. 1829 (partly).—*Ondatra*, Waterh., Charlesw. Mag. iii. 1839 (type *zibethicus*).

Obs. Although this well-known form presents many peculiarities, these are chiefly in adaptation to aquatic habits; it is strictly arvicoline in all essentials.

1. **Fiber zibethicus**, (L.) Cuv.

Syn. *Castor zibethicus*, Linn., S. N. i. 1766, 79.
Mus zibethicus, Gm., S. N. i. 1788, 125.
Myocastor zibethicus, "Kerr's Linn. 1792."
Fiber zibethicus, Cuv., R. A. i. 1817, 172, and of authors.
Lemmus zibethicus, Fisch., Syn. 1829, 289.
Ondatra zibethicus, Waterh., Charlesw. Mag. iii. 1839, 594.

' **Fiber osoyensis**, Lord, P. Z. S. 1863, 95 (British Columbia).

Hab. North America.

NEW SPECIES OF NORTH AMERICAN NOCTUIDÆ.

BY AUG. R. GROTE.

Acronycta exilis, n. s.

♀. A small species of the size of *A. vinnula*, and apparently belonging to the group *Triaena* of Hübner. The fore wings are pale, with a yellowish stain, noticeable on the ordinary spots and on the submedian space. The median lines are wide apart, geminate, faint; the t. p. line rectangularly exserted opposite the cell, running inwardly below the median vein. Both the stigmata are relatively large and vague, the reniform with a central ochery stain, which becomes easily lost. The median shade is obvious between them on costal region. The costal region is regularly dotted with pale black points at the inception of the lines; the median shade is very oblique, and the t. p. line has a separate dot for each of its component lines, here divaricate; there is also an independent dot midway between the median shade and the inner dot of the t. p. line, above the reniform, wanting in the succeeding species. A very narrow black dash above internal angle, broken before the margin. The basal streak and that opposite the cell are obsolete. Hind wings pale fuscous, with whitish fringes reflecting the markings of the under surface where the common line is distinct and lunulate on the hind wings, more dentate and medially exserted on primaries. A discal lunule on hind wings; on the more fuscous primaries a discal dash joined to the dark-marked crossvein. Head and thorax pale like the fore wings; black at the sides of the basal joints. Legs pale; tarsi black-dotted.

Expanse 30 mm. *Habitat.* New York (E. L. Graef).

Acronycta pauperoula, n. s.

♀. Of the same size and appearance as *A. exilis*, perhaps a little slighter built. This species differs by the shape of the t. p. line, which is more roundedly, less rectangulary exserted opposite the cell than in its ally, and notably less inwardly inflected below the median vein; its position is similar in the two species. The costal dots are fewer and wider apart, that above the reniform in *A. exilis* is here wanting. The geminate t. p. line is finer, the outer line more distinctly black, the inner faint; the orbicular is

a small complete annulus. The black basal streak is distinct, furcate on the oblique, geminate, waved t. a. line. The streak above the internal angle is distinct and continuous, and there is a faint darker shading outside of the t. p. line opposite the cell containing an obsolete streak. The whitish fringes are distinctly black-dotted. Hind wings as in *A. exilis*. Beneath the common line is faint and appears more even and straighter on the primaries than in its ally.

Expanse 30 mm. *Habitat.* Texas (E. L. Graef).

These closely allied species may be distinguished by the characters given above on close attention. *A. paupercula* seems to resemble *A. interrupta*, a species described by Guenée, from a drawing by Abbot; it seems to differ in the characters of the basal line as given by Guenée as well as in the color of the hind wings which are not at all yellowish in either of the two species described by me.

Eutolype, n. g.

A genus which I would refer to the *Bombycoidea* of v. Heineman.

The eyes are naked, and the small ocelli may be perceived on their margin behind the antennæ. The ♂ antennæ are bipectinate, thickly setose; the pectinations increase in length on the inside at basal third, and gradually taper thence to the tips, where they become obsolete. The labial palpi are short, as in *Dicopis*, and do not exceed the front, and are thickly haired with depending beard. The whole body is shaggily haired, and the short unarmed legs are nearly hidden by the lengthy vestiture. The thorax is comparatively heavy and square, and its proportion to the abdomen is somewhat as in *Dicopis*. On the disk is a tuft of metallic scales, such as have hitherto been recorded only of *Eudryas* and *Tolype*. The wings are long and rather narrow, the primaries with roundedly oblique external margin and defined apices. The general aspect recalls the Notodontians, but veins 4 and 5 are thrown off together on the fore wings, and the insect undoubtedly is Noctuidous.

Eutolype Rolandi, n. s.

♂. Cinereous fuscous. The markings on the primaries are obliterate. The ordinary spots can be made out, of a paler gray, the reniform very large, obsoletely black ringed. The t. p. line may be seen as an approximate gray sinuate band in some indi-

viduals. The blackish, brokenly dentate subterminal line, preceded by a gray shade, is usually observable and strikes the eye. Below vein 2 there is a stronger blackish accentuation or small dash. Fringes concolorous. Hind wings with soiled veins and whitish fringes, pale, transparent, ashen, with darker broken terminal line. Beneath the primaries are fuscous ashen; hind wings whitish, irrorate, with discal mark and traces of an approximate median band.

Expanse 36–37 mm. *Habitat.* Massachusetts, April 8th to 15th (Mr. Roland Thaxter, No. 1019); Missouri, April (Prof. C. V. Riley).

Dianthœcia pensilis, n. s.

♂ ♀. A bright gray, moderately sized species, shaded with blackish, with a certain resemblance to *Mamestra distincta.* Primaries whitish at base, with a black basal longitudinal streak. Median lines geminate, pale gray, approximate below median vein. Claviform deep black, acute, extending to median shade, apparently resting on a very fine black line which crosses the median space. A very obvious bright brown shade extends above it, below the median vein, from the t. a. line downwardly below vein 2 to the t. p. line. A similar but fainter shade stains the discal field beyond the reniform spot. Orbicular narrow, whitish, oblique, with an interior streak. Reniform pale, upright, moderate, with an incomplete interior black annulus. T. p. line lunulate, projected straightly outwardly along costal region, thence obliquely downwardly to submedian fold, where it forms a weak angulation to internal margin. A whitish shade below vein 2 on subterminal space setting off the lower black cuneiform marks of the s. t. line by contrast. The s. t. line is preceded by a series of such marks, increasing in size; on costal region the line appears as a white curve. A dark terminal line; fringes pale at base, fuscous outwardly. Hind wings pale fuscous, with soiled veins and traces of double transverse lines. Beneath pale gray, irrorate, with a common line accented on the veins and faint discal points. Thorax and head mixed blackish and gray; collar with a median black curved line. Abdomen tufted on the dorsum; ovipositor exserted; eyes hairy; tibiæ unarmed.

Expanse 30 mm. *Habitat.* Victoria (G. R. Crotch, Mus. Comp. Zoology, Cambridge, Mass.).

Heliotropha reniformis Grote, var. **atra**.

I have received from Mr. Geo. Norman, under the number 172, a singular variety of this species taken at St. Catherine's, Ont., August the 12th. The specimen is a female. The fore wings are entirely of a dead black, so that the markings become inconspicuous, and can only be made out with difficulty. The reniform is, however, entirely white, and becomes very prominent by contrast. The hind wings are more blackish than brownish-fuscous, as is the under surface and the body.

Gortyna cerina, n. s.

♀. A large species with the colors of *Xanthia silago*, but a very much larger insect. I refer it to Gortyna *Hübner=Hydrœcia*, B., Led., from the circumstance that the thorax is crested behind. There is a sharp tuft behind the collar. Bright yellow marked with dull reddish-purple. Head and thorax yellow, with the patagia and crestings shaded with reddish-purple. Fore wings widening outwardly, with sharp apices and rounded external margin, of an intense yellow; the terminal and sub-terminal spaces reddish-purple, separated by the narrow yellow sub-terminal line proceeding from a yellow apical shade spot. The base of the wing is shaded with reddish-purple. The markings are fragmentary; the orbicular small; the reniform large, narrow, diffusely annulated with purplish in broken blotches. The median shade is as apparent as the median lines, all somewhat ocherous, incomplete; the t. p. line scalloped. Hind wings soiled yellowish-white, a little darker tinted outwardly. Abdomen like hind wings. Beneath like hind wings above, with an obsolete median shade on secondaries; on the fore wings the darker tintings of the upper surface are partly reflected terminally.

Expanse 47 mm. *Habitat*. Kansas (Prof. Snow, No. 258).

The head seems to me more sunken than in *Xanthia*, to which the superb species might be referred at first sight from the coloring.

Himella, n. g.

The type of this genus, *H. fidelis*, is characterized by a resemblance to the species of *Caradina*, while differing structurally by the hairy eyes. The ♂ antennæ are brush-like. The palpi have the terminal article a little dependent. The tibiæ are unarmed; the body parts linear and slender; thorax untufted, hairy. The wings

are long, widening a little outwardly with slightly rounded, nearly straight external margin. The type has a casual resemblance to the species of *Ipimorpha*.

Himella fidelis, n. s.

♂. Of a peculiar, soft warm grayish fuscous, the fore wings concolorous. The basal half line is indicated by black dots. Median lines pale, even, shaded with blackish, approximate below the median vein. Ordinary spots very large, a little paler than the median space, rounded, very finely pale-circled, the reniform not excavate. T. p. line a little waved or uneven, pale, with a narrow preceding ochrey-brown shade line, a little depressed on costa. A very fine pale terminal line, fringes concolorous. Hind wings with white fringes and whitish at base, else largely fuscous; beneath whitish, irrorate with fuscous, and with a discal dot, and faint median shade. Thorax and head concolorous with fore wings. Palpi *black at the sides.*

Expanse 31 mm. *Habitat.* Albany (Mr. O. Meske).

Himella furfurata, n. s.

♂. The structural characters are those of the genus, but this species is very much smaller than the type, and the ornamentation is more like *Orthodes*. Fore wings pale ochrey fuscous. Ordinary lines geminate, blackish. T. a. line thrice dentatedly waved, minutely denticulate on costa. Ordinary spots small, inconspicuous, obsoletely outlined, the reniform darker than the wing, attenuate, black stained inferiorly. T. p. line denticulate, broken up into black points on the veins. Sub-terminal line pale, well removed towards the margin, preceded by an inconspicuous series of darker points. A terminal series of interspaced black dots. Costal edge dotted. Hind wings very pale, immaculate. Beneath very pale; sparsely irrorate; both wings show a distinct terminal series of black dots; there is a common median line and on the hind wings a moderate discal mark. Palpi inconspicuously blackish outwardly. Head and thorax like fore wings.

Expanse 26 mm. *Habitat.* Albany (Mr. O. Meske).

Tæniocampa capsella, n. s.

♂. The dark testaceous antennæ are bi-pectinate; the eyes hairy. The fore wings are blackish fuscous, silky, with an admixture of reddish scales, and remind us of those of *Dianthœcia meditata*. The lines are narrow, faint, interrupted, white. The

ordinary spots are moderate, blackish, very finely ochre-ringed. Minute white and black points on the veins beyond the t. p. line. Hind wings fuscous, paler at base, and allowing the distinct discal mark of the under surface to be perceived. Under surface blackish, hind wings partly whitish, with a narrow common line accented on the veins.

Expanse 28 mm. *Habitat.* Albany (O. Meske).

A dark species with silky wings, resembling an *Orthodes*.

Agrotis innotabilis, n. s.

This well-marked species resembles, at first sight, *A. bicarnea* and *A. c. nigrum* from the Atlantic States, but differs by its smaller size, and the absence of any carneous costal shades on the fore wings. Blackish; the collar is pale at base, and very broadly banded with deep black superiorly. Fore wings with the transverse lines narrow, continued, geminate, accompanied by narrow, pale shades. Orbicular small, spherical, lying in a deep black discal shade preceding and following it; reniform moderate, discolorous, ochraceous, distinct, of the usual shape with distinct internal ring; fringes blackish. Hind wings blackish fuscous, paler at base. Beneath paler with a purply tinge; a faint, narrow common line, a little irregular on secondaries, and discal dots. Body parts blackish.

Expanse 33 mm. *Habitat.* Saucelito, Cal., Aug. 25th (Mr. Behrens, No. 160).

I cannot observe the armature of the fore tibiæ in my type without breaking the specimen. It probably does not differ in this respect from its allies.

Agrotis euroides, n. s.

♂. A rather stout species, resembling at first sight some of the gray forms of *Mamestra* or *Eurois*. All the tibiæ spinose. Antennæ strongly pectinate, long, the pectinations decreasing to the tips. Whitish-gray. Collar shaded with black at the base, with a black line. Palpi black at the sides of 2d joint; terminal joint black near the socket. Primaries whitish-gray, with the costal edge tinged with carneous. The transverse lines are more broadly marked in black on the costal region, below which they are indistinct. The lunulate median shade is tinged with ferruginous or ochre below the reniform. Ordinary spots large, concolorous, black ringed, with black internal marking, lying in a blackish-

brown shade which obtains between them traversed by the black median shade. Terminal dots distinct. Hind wings dark fuscous; beneath closely irrorate with discal point. The primaries beneath show the costal edge carneous, otherwise like secondaries, without any apparent line. The thick body squamation beneath has a carneous or rosy tinge.

Expanse 40 mm. *Habitat.* California (Mr. James Behrens, No. 66).

Agrotis Bostoniensis, n. s.

♂ ♀. A rather large, stout, mouse-gray, concolorous species, with the male antennæ bristled beneath, and the fore tibiæ spinose. The lines and spots on the fore wings are indistinct, the fuscous lines geminate, component lines rather widely separate. Orbicular obsolete; reniform vaguely outlined, touched by the angulation of the median shade which is more distinct than the lines, and angulated below the spot. T. p. line with its inner component line minutely scalloped, more distinct than the outer line. Subterminal line a subcontinuous series of fuscous marks; fringes concolorous. Hind wings dark fuscous in the female, with white, narrowly interlined fringes; in the male nearly white, with soiled veins. Beneath with a faint median shade and extremely inconspicuous discal mark on secondaries.

Expanse 38 mm. *Habitat.* Newtonville (Mr. R. Thaxter).

The specimens were taken September 11th. Mr. Thaxter's numbers are 1057 ♀, 1058 ♂. It has some resemblance to the European *A. cinerea*, but it is, perhaps, nearest to *A. violaris*, G. and R.

I have received also from Mr. Thaxter specimens of *Agrotis badinodis*, Grote (No. 1063), taken Sept. 11th, and *Agrotis geniculata*, G. and R. (Nos. 869, 870), taken Sept. 8th, in the same locality.

Owing to Mr. Morrison having sent me a specimen of *Melaporphyria immortua*, as I understood from his collection, I have erroneously credited him with the species instead of Mr. Thaxter in my original description (Bull. Buff. Soc. N. S., 2, p. 75). I have received a specimen since from Mr. Thaxter, under the No. 259, collected by him at Newtonville, Mass., June 12th.

Oligia *Hübner*, s. g.

A slight form allied to *Hadena*, apparently distinguishable by the more curved, divaricate labial palpi. Antennæ in the male

simple, pubescent beneath. Eyes naked, with short black lashes. The thoracic squamation consists of narrow scales. Maxillæ rather weak. Abdomen linear; collar broad; thorax crested behind: front broad, exceeded by the palpi. Legs unarmed: the median spurs on hind tibiæ situate without the middle of the joint.

Hadena (Oligia) versicolor, n. s.

Dark brown with a more or less decided ruddy tinge Primaries shaded with ochreous along internal margin, and with a well-sized distinct deeper ochreous apical patch. Ordinary lines obsolete, whitish, broken by black points on the veins; the t. p. line emanates from a distinct and large white spot on the costa above the vague reniform, which latter is preceded by a distinct black shade on the disk, an evident feature of the ornamentation of the wing. Hind wings uniform pale fuscous, silky; beneath as above with a discal dot and distinct darker median shade line. Fore wings beneath blackish with traces of the continuation of the median line, paler terminally. Head and collar brownish; tegulæ paler; thoracic crestings tipped with blackish.

Expanse 20 mm. *Habitat.* St. Catherine's (Mr. Geo. Norman, Nos. 77 and 79). Taken in June.

Hadena (Oligia) tracta, n. s.

A little stouter than the other species, and resembling the common *O. Chalcedonia* (Hübn.)? in ornamentation. Head and collar dark brown. Tegulæ and thoracic disk smooth pale fawn color, and this lighter tinting spreads over the fore wings at base, and extends, obliquely upwardly, to beyond the t. a. line over the costal region to the median shade. Median lines geminate; t. a. line forming wide dentations; t. p. line white shaded, emanating from a double white costal mark, angulate opposite the cell, nearly perpendicular, a little inwardly bent at median vein, skirting the pale and small reniform spot which latter shows a dark central line. The wing is darker, blackish shaded within the t. a. line at the edge of the oblique pale basal shade, and on the disk. A large ochrey apical blotch, below which the thread-like angulate subterminal line may be faintly discerned. Hind wings translucent whitish, shaded with blackish over the apical region and superiorly along the terminal margin; beneath with faint dot and obsolete line.

Expanse 23 mm. *Habitat.* Texas, Dallas Co., Boll, in Mus. Comp. Zoology, Cambridge. This species differs from our common species from New York, provisionally determined as *Chalcedonia* Hübn.? by the smaller reniform, stouter form, and the peculiar basal shading on the primaries.

Apamea Ochsenheimer (1816).

This genus is established in the Schmetterlinge von Europa, 4, p. 75, and divided into three "families" or groups: "A," with *nictitans*, etc.; "B," with *furuncula*, etc.; "C," with *testacea*, etc. Hübner next proposes distinct genera which sufficiently correspond to Ochsenheimer's three groups viz., *Sideridis* for the group "A," *Oligia* for the group "B," and *Exarnes* and *Ogygia* for group "C." For some one of these genera the original term *Apamea* has to be restored.

Boisduval, in 1829, divides *Apamea* Ochs. into two genera; retaining *Apamea* for a group of species headed by *nictitans*, which embraces species included under all three of Ochsenheimer's divisions, and proposing *Luperina* for *testacea*, and allied forms. This latter genus is styled "*Apamea*" by Lederer, in whose work an exposition of generic character is the strongest feature. Lederer's genus "*Luperina*," contains none of Boisduval's species, and cannot remain. It must be resolved into *Luceria*, v. Hein., with the type *virens*, and *Ledereria* with the group "B." For Lederer's "*Apamea*" the term *Luperina*, Boisd. (with the type *testacea*), must be retained.

Two generic types *nictitans* and *leucostigma* are included in Boisduval's genus *Apamea;* the other species seem to be now considered as Hadenas s. g. *Oligia.* The original type of *Gortyna*, Hübner (Tentamen) is referred by Guenée to the genus *Hydrœcia*, Guen. I have restored Hübner's original application in the "List of the Noctuidæ of North America." In my work I have not arbitrarily chosen the type of any genus, but have endeavored to apply the rules of zoölogical nomenclature throughout. In our researches after the true type of *Apamea* we must choose between these two species, *nictitans* and *leucostigma*, both contained in Ochsenheimer's family "A," in the order cited, and both contained in oisduval's restriction of that term. For the first species we have Hübner's term *Sideridis* to consider. Giving the priority to *Apamea* in the first instance, I think we must consider all of Hübner's genera erected at the expense of this term, and

without its recognition for any of the species, as standing on an equal footing. We are not encumbered in this matter by any consideration of Guenée's term *Hydrœcia*, for his indication of the type makes it synonymous with *Gortyna*, Hübner. To many of Hübner's genera, *e. g. Agrotis*, continental authors cite Treitschke or Ochsenheimer from prejudice or tradition. Here, in the United States, we should be free from either sentiment. I see nothing in all this embroiled synonymy to prevent my proposing to fix the type of *Apamea* on *nictitans*, in rectification of my undoubted error on page 18 of my "List," where I overlooked Guenée's distinct indication of *micacea* as the type of his genus *Hydrœcia*. In Ochsenheimer's mind *nictitans* was evidently the type of his genus *Apamea*, and the term was evidently intended for the smaller white-flecked species allied to *Gortyna*. For Lederer's genus "*Hydrœcia*," in its integrity, the term *Gortyna* should undoubtedly be used, as I have before shown. I think I am warranted in dividing it into two genera: *Apamea*, Ochs., with the type *nictitans*, and *Gortyna*, Hübner, with the type *micacea* indicated by Hübner in his Tentamen (1806). Our North American species of Apamea are as follows:—

1. **Ap. nictitans** (Linn.).
   var. erythrostigma (Haw.).
2. **Ap. sera** (G. & R.).
3. **Ap. inquæsita** (G. & R.).
4. **Ap. purpuripennis**, Grote.
5. **Ap. semiaperta** (Morr.).

I have already referred the *Hydrœcia lorea*, of Guenée, which has hairy eyes, to *Mamestra* in the "List of the Noctuidæ of North America."

As yet I have seen only the var. *erythrostigma* (Haw.) of *A. nictitans* from California; the typical form doubtless occurs there. The specimens were large and highly colored.

Apamea purpuripennis, n. s.

♀. Allied to *H. semiaperta*, Morr., slighter, of a more rich purply-red, something like the species of *Nephelodes* in the tint of the silky primaries. Transverse lines narrow, inconspicuous, the median lines more approximate than in its ally. The median space, centrally, is largely stained of an intenser hue than the rest of the wing. In this deeper shading is placed the white re-

niform, more acute inferiorly than in *H. semiaperta*, shaded with purplish and not well defined superiorly, somewhat V-shaped. Terminal space again darker tinted; fringes concolorous. Thorax like fore wings. Hind wings dark fuscous, silky. Beneath paler, purply powdered, without perceptible markings. Antennæ simple. *Expanse* 28 to 30 mm. *Habitat.* Newtonville, Mass. (Mr. R. Thaxter, Nos. 701 and 587). Taken June 6th and August 7th.

Pseudorthosia pectinata, n. s.

♂. The tibiæ are all spinose. The species differs from the Californian *P. variabilis* in the longer pectinations of the antennæ. The color is probably variable as in the Californian form. In the specimen it is ochrey-brown, somewhat olivaceous; all the lines are obsolete. The reniform is merely indicated by a vague clouding. The subterminal line is preceded on costa by a deeper tinting. Hind wings blackish fuscous without lines. Beneath quite pale, with a brighter dusting of scales, without markings, except a lunulate discal mark on the fore wings. Thorax like primaries above.

Expanse 35 mm. *Habitat.* Colorado Territory (Mr. Mead, No. 37).

Pseudorthosia variabilis, Grote.

Mr. Behrens has taken a number of specimens at Saucelito during September, which vary from olivaceous through orange-brown to pale in color. The species may always be recognized by the median shade, and the configuration of the stigmata.

Plusia labrosa, n. s.

♂. A lovely species, larger than *P. pasiphæia* Grote, and differing in color and the shape of the metallic mark. Rosy purple, shaded with olivaceous brown on the median space below the nervure, before the subterminal line, and on terminal space at the extremities of veins 2 to 4, and again at apices. Median lines narrow, pale, stained with ochreous. Reniform narrow, 8-shaped. Metallic mark bold, yellow white, not divided, extending outwardly nearly to the t. p. line, resembling that of *Precationis*, to which this handsomer species is allied. Subterminal line distinct, deeply angulated, forming two broad teeth between veins 2 and 4, beyond which the terminal space shows three olivaceous shades. Hind wings fuscous, with broad blackish borders. Head and thorax rosy purple, shaded with olivaceous brown on the collar

and face of the thoracic crestings. Beneath the wings are yellowish-fuscous with obliterate markings.

Expanse 38 mm. *Habitat.* Saucelito, Cal., August 18th (Mr. Behrens, No. 162).

Plusia epigæa, n. s.

Allied to P. ampla *Walk.*, but with differently colored fore wings and with the attenuate discal mark outwardly produced inferiorly. Fore wings slatey or silky lilac-gray, watered in appearance from the character of the transverse darker shades. The discal spot is open, with the two limbs very narrow, inclosing a trigonate space below the median vein of the ground-color of the wing, and with its inferior portion directed outwardly more boldly in the shape of the tail of a T., terminating roundedly. The spot surmounts a deep brown shade stretching across the median space, but not extending to internal margin, with a bright red stain where it reaches the t. p. line. Reniform partially black ringed, oblique, touched by the black median shade line which is apparent on the costal region. T. a. line oblique, angulate, much as in P. ampla. Orbicular small, apparently open to costa. Thorax colored like fore wings, with elevated central crest, the outer face of which is deep brown, discolorous. Hind wings, testaceous fuscous, with darker borders, and pale fringes dotted interspaceally with fuscous. Beneath fuscous, the usual markings obliterate.

Expanse 40 mm. *Habitat.* New York.

Note.—The following description of a North American Noctuid (which I have not identified) was found among the papers of Linné, and published by Afzelius, Berlin, 1826, p. 137, No. 10. The Swedish original of the work is dated in 1823.

Phalæna Omicron.

Noctua spirilingues: alis superioribus O. albis inscriptis; inferioribus ferrugineis immaculatis. *Hab.* in America Septentrionali; Anna Blackburn. *Hab.* Phal. Gammæ. Corpus cinereum incisaris albicantibus. Antennæ nigræ. Pedes nigri genicalis albis. Alæ superiores supra griseo-nebulosæ, O. albo notatæ, infra cinereæ; inferiores supra helvolæ, latere anteriore magis fuscescentes, infra cinereæ et subferrugineæ; puncto arcuque nigro obsoletioribus.

I am indebted to Doctor Hagen for the communication of this description. Since a second American moth is described in the

same work as coming from New York, from the same person, it is possible that the specimen above described came from the same locality. The second species is apparently a Geometrid, and called *Phal. Geom. extenaria.* It is barely possible that Linné intended our common *Plusia simplex* by his description of *Phalæna Omicron.*

Scopelosoma devia, n. s.

♂. The new species resembles *S. Morrisoni* in that the primaries are crossed by pale shade lines, but it differs from all the species in their course. The color is dark olivaceous fuscous, darker than *S. Walkeri;* and the lines are accompanied by an olive shading. The median lines are even, and nearer together, especially on the costa, than in the other species. The t. a. line is even, and runs *inwardly* obliquely from the costa to internal margin. The t. p. line is nearly straight, a little flexed, not roundedly exserted opposite the cell. The concolorous reniform is annulate, upright, pale ringed, not constricted, narrow, slightly luniform. The pale subterminal line is preceded first by an olive shading, and secondly by an even, distinct, pale shade, which is wanting in the other species; hind wings dark fuscous; body parts concolorous. Beneath the wings are a little paler, fuscous, subirrorate, with a common blackish median shade line and discal marks.

Expanse 32 mm. *Habitat.* St. Catherine's (Mr. George Norman, No. 12).

Although it is sufficiently apparent that the species of *Scopelosoma* are variable, and that we cannot rely on the ground-color of the primaries for specific character, I believe we shall have to discriminate three species at least of the group of *vinulenta.* I am now inclined to reconsider my identification of *sidus* Guenée, whose indefinite description is not of much use where we have to descriminate between several species.

I think it now more probable that Guenée has described *vinulenta* as *sidus*, and that "sidus" *Grote*, will prove a form of *S. Walkeri* Grote, in which the primaries are stained of a light reddish, and the spots are variable as in the deep-colored *S. vinulenta. S. Morrisoni* varies in the tint of the primaries in a corresponding fashion. We should then have the following species:—

1. **S. vinulenta** Grote. ?*S. sidus*, Guen.
2. **S. Walkeri** Grote, var. *sidus*, Grote.
3. **S. Morrisoni** Grote.
4. **S. devia** Grote.
5. **S. Grandaea** Grote.

The latter species one might be tempted to refer to *Glæa* or *Xanthia*, but the elongate dentate primaries would determine its generic position.

Caloeampa cineritia, n. s.

Distinguishable from *C. currimacula*, Morr., and *C. nupera*, Lintn., by the absence of any basal dashes on the primaries. Fore wings bathed in ashen from the base to the blackish fringes, allowing an ochreous shade to extend outwardly beyond the reniform over the subterminal line, the latter here more distinctly marked by uneven cuneiform dashes. The black ringed ordinary spots are so close as to nearly coalesce; they are wider apart in *C. currimacula*. The costal region is shaded with deep brown; the extreme base of the wing is whitish; the t. a. line is visible, strongly dentate, geminate; the costal edge is black; the thorax is black, as in the European species, not brown as in *Currimacula;* the sides at the base of the primaries are white; the collar is pale brown, finely lined; the front and palpi blackish; hind wings concolorous, ruddy fuscous; beneath ruddy fuscous with dentate median line and discal point on hind wings.

Expanse 50 mm. *Habitat.* Newtonville, Mass. (Mr. R. Thaxter, No. 44. May 19th).

This species resembles *C. retusta* perhaps more than *C. nupera* does, and might stand for its American "representative." I have, following Mr. Morrison's remarks, been disposed to consider *C. nupera* as the American "representative" of the European *C. retusta* (Bull. Buff. S. N. S., 2, p. 195). *C. nupera* appears to me to resemble the European *C. exoleta*, rather than *C. currimacula*, in opposition to Mr. Morrison's opinion on the subject. There are no brown shades on the internal portion of the wing in *C. cineritia*, nor is the terminal space ochraceous, except opposite the disk, and as the continuation of the same shade opposite the reniform. There are no superposed dots representing the orbicular as in *C. retusta*, from which *C. cineritia* seems to be easily distinguishable by the configuration of the ordinary spots. The

three American species of *Calocampa* appear to me easily separable from the two European. The species had very probably a common tertiary origin, and the question of one species "representing" another has probably no proper basis in fact. At any rate, we must agree with Mr. Lintner that the American *C. nupera* does not "represent" the European *C. vetusta*, and the comparison between the species on page 195, of vol. ii. Bull. B. S. N. S., must be omitted.

The inquiry as to what species from America Mr. Walker has regarded as the same as *C. vetusta*, seems to me entirely barren. The European species was included in the "List of N. Am. Noctuidæ" upon Mr. Walker's authority, and whenever a European species is cited in that list, it is understood to be on the authority cited after the original description. Where no other than the original description is given (as for instance *Agrotis baga*, p. 2) the Author of the "List" assumes the responsibility.

Pyrrhia illiterata, n. s.

♀. The moth agrees with *Pyrrhia* in the unarmed fore tibiæ, and the sharp tuft behind the collar. It differs greatly in the appearance of the ordinary lines from our hitherto described species *exprimens* and *angulata*. Entirely reddish orange, the collar and tegulæ faintly margined with fuscous. Primaries with the transverse lines narrow, undulate, denticulate, the t. a. and t. p. lines tending to be accented by interspaceal points. The lines are fuscous or blackish, unaccompanied by any shades. Ordinary spots like the lines, incompletely outlined, concolorous, the orbicular spherical, moderate. Sub-terminal line indicated by dots, with a preceding dark costal shade and a shade spot opposite the cell. Hind wings stained with red, with a narrow fuscous subterminal shading, like that of *Heliothis*, but less prominent. Beneath with a common continued fuscous exterior line becoming obliterate on the hind wings inferiorly. Discal marks on primaries, but none on secondaries.

Expanse 32 mm. *Habitat.* Mendota, Ill., from Prof. C. V. Riley. Taken in August, 1872. Mass., from Mr. Thaxter.

The moth has some resemblance to *Xanthia*. The clypeus is, however, fuller, and the habitus more that of the genus to which I have referred it.

Tamila tertia, n. s.

♂ ♀. At first sight the species recalls the genus Tarache (*Acontia*), but the armature of the tibiæ allies the moth to *Heliothis*. It agrees with Tamila in the fact that the vestiture of the thorax consists of flattened scales mixed with hair. The fore tibiæ have a double row of short spinules terminating in a stout short blunt spine on the outside. White or with a yellow brown tinge. Fore wings dark at base, with the t. a. line black, projected on median nervure, a little irregular. The anterior and widest half of the median space beyond the line is nearly white or pale to the median shade, showing the faintly marked orbicular. Beyond the median shade the median space is shaded with olivaceous fuscous, as is the rest of the wing except the rivulous white subterminal shade; the white usually obtaining again before the t. p. line. Reniform rather large, outlined outwardly in black, suffused with a leaden hue. T. p. line sinuate, geminate, the outer component line black, broken. A terminal black broken line preceded by pale shading. Fringes olivaceous fuscous, the extremities pale and dark dotted. Hind wings whitish with a subterminal fuscous shade and discal mark. Beneath white, with a large black discal mark on primaries, and a subterminal transverse fuscous shade furcate superiorly. Hind wings with a faint discal lunule and terminal shading. Body parts white or pale, the black ovipositor shortly exserted.

Expanse 26 mm. *Habitat.* Texas (Boll).

A darker tinted, less whitish specimen has been sent me by Mr. E. L. Graef from Texas. The dark color is less olivaceous than in *T. nundina*, from which the species is separable by the distinctly marked median lines.

Pseudolimacodes niveicostatus, Grote.

In my original description of this genus and species (Stett. Ent. Zeitung), I referred it to the Nonfasciatæ, but on account of the projecting head, stout and prominent labial palpi, and in particular the pattern of the ornamentation, I believe we must place it among the Fasciatæ of Borkhausen. The neuration has not been studied. It differs from all the genera known to me in this latter group by the proportionally short, stout, and distinctly brush-like antennæ. The obliquity of the line beneath on the hind wings is indicative of its affinities. The lines on the primaries above are like *Phurys* somewhat in position. The colors are intense rosy

silky brown, and in this respect the concolorous species recalls *Panopoda*, *Pleonectyptera*, and other bright-hued quadrifid genera. The costa is white to the inception of the outer transverse line. The inner line is outwardly rounded, oblique; approaching the straighter outer line on internal margin. The two lines are dark with pale rosy shadings. A white transverse streak in the place of the reniform. No other markings on the wing. The hind wings are faintly crossed by a diagonal streak. A ♂ specimen has been sent me from Massachusetts for identification by Mr. Morrison expanding 28 mm.

Homopyralis, n. g.

This genus appears intermediate between the genera allied to *Homoptera* and the Deltoids. The eyes are naked, ocelli very small. The male antennæ are lengthily pubescent beneath with a longer bristle on each side of each antennal joint; in the female the pubescence is absent, and the lateral bristles somewhat shorter. The palpi are long and exceed the front, curved, with elongate third article, closely scaled. The thoracic squamation consists of flattened scales with rounded, even apices, those attached to the prothorax very broad; there is a very slight admixture of hair. The size is small, the body slender, the wings broad with Homopteriform ornamentation, the tibiæ unarmed.

Homopyralis tactus, n. s.

♂ ♀. Dark brown, concolorous Transverse lines black shaded. Orbicular a small black dot; reniform a larger black subluniform spot touched by the double median shade which forms the most noticeable feature of the wing, and is repeated on the secondaries where it includes the black discal spot. The t. p. line is geminate, marked on costa, sometimes merely indicated by dotted fragments opposite the cell, where it is somewhat rectangularly exserted, running inwardly below median vein, and approximating to the median shade on internal margin. Costal, pale, ante-apical dots, below which the costal region is darker shaded before the faint subterminal line. A terminal interspaceal series of dots; fringes concolorous. On the hind wings transverse rivulous shades without the black median shade; on internal margin these are relieved by a pale yellowish staining. Beneath pale, with common transverse shades, imitating the upper surface, and with a resemblance to the wider surface of the wings in *Pseudaglossa*.

Expanse 27 mm. *Habitat.* Mass.; N. Y.; Va.; Texas (Belfrage, Oct. 29th).

Homopyralis tantillus, n. s.

♂ ♀. Both sexes of a species smaller than *H. tactus*, of a more blackish color, and with the median shading less apparent. The paler dottings of the costal region are more distinct and relieved. It may be distinguished also by a series of paler dots at the base of the fringes, absent in its congener.

Expanse 23 mm. *Habitat.* Va.; Texas (Belfrage, Sept. 17th).

The genus may precede *Phalænophana* on page 47 of the "List of the Noctuidæ of North America."

NOVEMBER 17.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-three members present.

Anthers of Ambrosia artemisiæfolia.—Mr. MEEHAN desired to correct an error into which he had fallen, in some observations on the Ambrosia artemisiæfolia, contributed to the Academy's *Proceedings* a few years ago. Among other things, he stated in that paper that there were two classes of anthers in the flowers, one barren, and surmounted by a short horn, the other polleniferous, and hornless. He had been led to re-examine the matter through the kindness of Professor Asa Gray, who had written to him, after his remarks had been quoted in Hooker and Bentham's *Genera Plantarum*, expressing doubts as to the accuracy of the observation. He now found he was wrong. There is but one class of stamens, and all have horns. He expressed regret for the error, believing inaccurate observations the bane of science. He would only say in extenuation that the error was one easily made. The parts are exceedingly small, requiring a strong glass to see them. The small horn is *bent down closely against the back of the stamen*, and does not become erect until the pollen has been discharged. He thus had concluded it did not exist. Then the pollen must be ejected in some way very rapidly after the pollen sacs have burst, and the dry membranous remains so freely mixed with what appeared perfect anthers had misled him. The bursting and emptying by the sacs of their pollen, and the erection of the horn, he thought must take place suddenly and early in the morning, as he had found no change whatever in the various parts of the inflorescence after 9 A. M. He had hoped to be able to give the exact time and manner of these actions, but the approach of winter had destroyed the specimens, and he was unwilling to let the season go over without correcting the error in the particulars named.

Dimorphism in Apples.—Mr. THOMAS MEEHAN said that of late years it had been an interesting question what influence was exerted on the character of the fruit immediately by hybridization. He had himself brought to the notice of the Academy, instances which proved in some cases there was an immediate influence, as well as on the progeny of the fertilized fruit. But he believed there was more claimed for this immediate influence than the facts warranted. In the apple there had been many instances in scientific journals of the highest character, in which it was believed that two distinct fruits had combined in one apple by

hybridization. The chief mixtures were generally russets with lighter apples. He exhibited one which had been sent by Mr. J. J. Thomas, of Union Springs, in which the upper half was russet and the lower of some green kind. In this case, however, it was clear that the russet was formed by some element of destruction in the epidermal cells. In the bark of most trees suber cells had in each tree a specific form of development, and were generally very uniform in their conditions of growth. They usually destroyed the bark as they grew, and generally in some one regular direction, and this gave the characteristic fissures to the bark of trees, and not mere mechanical expansion, as was popularly supposed. It was not always regular, however, as in the plane tree it was erratic, and thus the bark peeled off without any regular plan, and in the most unexpected places. The skin of the apple was but modified bark, and in the epidermis were cells subject to the same laws of development as in bark. In the beech only a very thin film was subjected to the destructive agency of the suber cells, changing the color of the young green shoots to an ashen-gray in age, without any deep rifts ever appearing. In the apple, both in the bark and fruit, the cells proceeded in much the same way, erratic sometimes as in the beech, and acting on the thin external membrane as in the beech or plane. The russet appearance followed this action in the apple and pear. Very often it appeared near the stem cavity. Frequently on the same tree there would he large numbers russetted in this way, as well as many without. The variable nature of the russet growth was more frequently seen in the pear than in the apple. He had seen in these kinds in some seasons and places all yellow, the half or more covered with russet in others.

He had never seen the peculiar condition of the parts exhibited in Mr. Thomas's specimen before, but it was evident that all the phenomena pointed to some similar external cause, and that cross fertilization had nothing to do with these dimorphic cases.

Mr. M. also exhibited another specimen similar to the one produced last year, from the tree at Kittaning, Pa., which bore fruit, without the production of calyx, corolla, or stamens. The upper portions of the series of the embryonic leaves which form the fruit, were more free than in that exhibited last year, affording a better illustration of the morphology of the parts.

Blindness of Salmon.—Dr. A. G. REED made the following remarks regarding the cause of blindness of the salmon: In the month of August, 1873, I ascended the Tobique River, of New Brunswick, to its head-waters, for the purpose of salmon fishing, and thence descended the Nipisiquit River, where I found the best salmon fishing in the province.

While on the Tobique River my Indian guide captured a large salmon so easily that it attracted my attention, when he told me

it was a blind salmon; and upon examination, I found this fish had various scars on his head, the left eye had sloughed out, the right eye had a cut across it, and a thin film had formed over the eye, causing him to be entirely blind. I learned from the Indians that it often occurred that large salmon became blind, and did not return to the sea with the rest of the fish for feeding, but remained in the deep pools of the river, and eventually starved to death. The Indians have many theories regarding the cause of this blindness, none of which are plausible. During this trip I had several chances of seeing salmon that were either blind in one or both eyes, but did not at that time find out the true cause. But during the past summer, while fishing on the tributaries of the Saguinay River, in Canada, I again saw the same disease presenting itself in the salmon of those streams. I noticed that no small salmon are found in this condition, and that all the blind ones have cuts across the eyes and head, producing scars as if some line or thread had been drawn tightly across the eyeball.

My view of the matter is that the fish in ascending or descending the streams come in contact with gill-nets that are set for the capture of this fine fish for food, which the inhabitants of that region use during their long cold winters. The meshes of the nets are of the proper size to allow a large salmon to pass his head through as far as the eye, while the smaller fish pass the head further through, and thus escape the cut of the fine linen thread across the delicate membranes of the eye.

This cut if deep produces sloughing, but if slight, inflammation and infiltration of the conjunctiva, thereby rendering it opaque.

It is only the large noble fellows that escape capture by these nets, with their heads scarred and their tails slit, showing the fearful struggle they had in clearing themselves of the nets spread for their capture, and living to become blind—never again to return to their feeding grounds, and soon to die of starvation.

NOVEMBER 24.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-two members present.

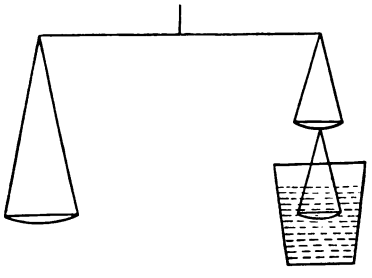
Paul Beck, George Gerry White, James G. Pease, George F. Barker, W. J. Hoffman, M.D., Joseph D. Potts, David E. Dallam, W. W. Jeffries, and Miss Adeline S. Tryon were elected members.

DECEMBER 1.

The President, Dr. RUSCHENBERGER, in the chair.

Thirty-three members present.

On Specific Gravity.—Prof. LEIDY remarked, that, in taking the specific gravity of minerals by means of the scales in weighing the substance in water, the usual plan was to suspend it from one side of the instrument by a delicate thread or hair. The attachment of the specimen was tedious and often difficult, especially in the case of small crystals and polished gems, from which the hair would slip, and could only be made to retain its position by causing it to stick with some adhesive matter. He dispensed with the thread or hair, and substituted on one side of the balance a double dish, as represented in the figure. The lower dish is perforated, and is kept suspended in a glass of water. After weighing the specimen in air in the upper dish, it is simply necessary to change its place to the lower dish to weigh it in water.



Coloring of Autumn Leaves.—Mr. THOMAS MEEHAN presented some leaves sent to the Academy from the West, illustrating the influence of light in coloring autumn leaves. They were of the red or swamp maple, *Acer rubrum*, and had been fastened in pairs by a spider's web. The uppermost leaf, obstructing the sun's action on a portion of the lower, had prevented any change of color in the unexposed part of the lower leaf, and thus the exact form of the upper was photographed or outlined on the lower one. Mr. Meehan said there was nothing new to science in this observation, as orchardists were well aware that the coloring of apples and pears was deepest on the sunny side; and that when entirely shaded from the sun, by over-hanging leaves or branches, they were almost colorless.

This fact was often taken advantage of to photograph names by stencilled paper on fruits. At the Great Sanitary Fair held during the war, fruit with names of Grant and Lincoln thus "sun burnt" on them, brought good prices.

Still it was well to remember that the sun could not be the sole cause of color. Apples exposed to the same sunlight would be

often striped, and the dark colors would often be of various shades. Besides this, European trees which had no color in their own country, when planted side by side with allied species here, still preserved the same characteristics. Neither heat, nor light, nor frost made the slightest change. The English oak beside the closely allied American white oak retained its green color till absolutely dried up by frosty winds. On the other hand, our colored-leaved trees preserved their same colored characteristics when growing in Europe under very dissimilar circumstances to those at home.

In spite of the visible action of the sun in the instances exhibited and quoted, it was clear from the facts referred to, that solar or chemical action could not be the sole cause of autumn colored foliage. Though it seemed an incipient stage of decay, involving chemical change, the coloring of the apple in the sunlight, or of the autumn leaf, ceased if taken from its parent tree. It had to remain on to the last, to get its full tints. Vital action of some sort, therefore, must be taken into account by those who are investigating the subject.

The Committee to which it had been referred recommended the following paper to be published:—

DESCRIPTION OF A NEW SPECIES OF HELMINTHOPHAGA.

BY HEROLD HERRICK.

Helminthophaga Lawrencii, Herrick. Pl. 15.

Upper parts and rump olive-green, a shade darker than in Pinus. Wings bluish-gray with two white bands, the upper not so clearly defined as in Pinus. Tail bluish-gray with the three outer tail-feathers with most of the web white, also a small white spot on the end of fourth feather.

Crown and under parts, from the breast to the vent, orange. A broad black patch extends from the bill through and behind the eye. Chin, throat, and forepart of breast black.

A yellow stripe, commencing under the bill, extends back between the black eye and breast patches and increases in width upon the shoulder. Length, 4.50. Wing, 2.50. Tail, 2. Measurements from mounted bird.

The bird from which the above description is taken I obtained from my friend, Mr. D. B. Dickinson, of Chatham, New Jersey, in whose collection I found it. Its capture, as nearly as I can ascertain, was in May, 1874, on the bank of the Passaic, near Chatham. The specimen is evidently an adult male, and is so clearly and strikingly marked as to preclude the possibility of its being an unusual form of Pinus or Chrysoptera, its nearest allies, or a hybrid. Its general appearance is at first like Pinus with the black eye and throat patches of Chrysoptera, but a closer examination shows little peculiarities that do not exist in either. Of its title to a place in our Helminthophagas there can be no doubt, and I take greater pleasure in recording it, because of its capture in New Jersey, a section already so thoroughly worked up. For a name, I think none can be so appropriate as that of my esteemed friend, George N. Lawrence, Esq., in recognition of many favors in the past, and of his untiring labors towards the promotion of ornithology.

DECEMBER 8.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-eight members present.

Continuous Growth in Fungoidal Excrescences.—Mr. THOMAS MEEHAN exhibited some excrescences, growing on branches of *Quercus tinctoria*, the black oak, gathered from above the remarkable quarry of broken rocks at Edge Hill, which had been brought to the notice of the Academy last year by Mr. Rand, and remarked that all familiar with our forest features must have often seen similar excrescences, which were the work of insects, and partook of the nature of galls. An examination of these exhibited showed them to be of fungoid origin, and similar in their nature to the familiar knots on the plum and cherry, which through the researches of the late Mr. Walsh and Prof. Peck, of Albany, were now known to be of fungoid, and not of insect origin. These, however, and he believed most of the excrescences of this character, completed their growth within one year, becoming dead and dry the subsequent season. Sometimes new matter would form near the point of issue of the old one; but this was wholly from the branches, and added nothing to the growth of the former year. In the case of these Edge Hill specimens, the growth of the excrescence was as regularly continuous as the other woody portions of the tree, and seemed to endure while the tree lasted. The first season the excrescences were small, the second as large as marbles, and the third often equalled a walnut in size, while some on the trunks and main branches were as large as an average sized oyster-shell. The minute fungoid organisms that formed these excrescences were usually short-lived; and their longevity in these instances he considered remarkable.

On a New Mastodon and Rodent.—Prof. COPE made a communication on the Elephants obtained by himself in New Mexico and Colorado during the past season while attached to the Wheeler Survey. He had obtained *Elephas primigenius* var. *Columbi* from post-pliocene beds at the base of the Zandia mountains, and the *Mastodon ohioticus* from corresponding beds near Taos. The former species he had also obtained from the valley of the South Platte in northeastern Colorado. The pliocene sands of Santa Fé contained numerous remains of a *Mastodon* which Leidy had referred to his *M. obscurus*,[1] but which is obviously a different species, and being without name, Prof. Cope proposed to call it *M. produc-*

[1] Report of Geolog. Surv. Terrs., Vol. I. 4to., p. 235.

tus. He gave a list of the North American Mastodons, referring them to the two groups characterized, the one by the continuous cross-crests divided by a fissure only, the other by the transverse series of two or more deeply separated tubercles. To the first he referred *M. ohioticus*, Cuv., and *M. proavus*, Cope; to the second *M. chapmanii*, Hays (from which *M. obscurus* could not be at present distinguished), *M. shepardii*, Leidy; *M. andium*, D'Orb. (the last two referred by Leidy to *M. obscurus*); *M. mirificus*, Leidy (closely allied to *M. humboldtii*), and *M. productus*, Cope.

No question as to the distinctness of the *M. productus* could arise, although our knowledge of the *M. chapmanii* to which it has been referred is very slight. As described by Drs. Hays and Leidy, the lateral tubercles of the molars in that species are closely appressed or not separated, being sometimes continuous across the crown of the tooth. This description applies to one of the specimens (a cast) selected by Dr. Leidy as his type, and to a second specimen referred by him to the *M. andium*. The second type specimen of Leidy, a fragment of a posterior molar, is undistinguishable from corresponding parts of *M. andium*. The *M. shepardii* as described by Leidy is evidently quite distinct from both the preceding and from the *M. productus*, in the absence of accessory tubercles of the lateral principal cusps of the molars.

The *M. productus* was characterized as follows:—

The posterior inferior molar supports five transverse series of tubercles, of which the posterior is less developed than the others. Each series is composed of two cusps of a conic form which are separated deeply from each other, and are not united at the base so as to become confluent on attrition. The cones of the outer side support one or two accessory tubercles on a line with their inner or median face, so that the transverse section of a worn tooth with the two accessory cusps is that of a trefoil with the lobes inwards. The penultimate molar in the same jaw supports three transverse series. The symphysis is elongate depressed and subspatulate; its proximal half is excavated, the distal half flattened. Two tusks project from the extremity; they are short, obtuse, and flattened on the inner side. Total length of a specimen which is entire from the end of the symphyseal tusks to just behind the last molar, 29 inches; length to first molar (penultimate), 19 inches; length of first molar, 4.25 inches; of last molar, 6.5 inches; width of same, 3 inches. Width across the rami at end of last molar, 18 inches; do. between anterior borders of first molar, 2.5; do. of symphyseal spout, least, 4.5 inches; at base tusks, 4.75 inches. Length of free portion of symphyseal tusks, 4 inches; diameter of do. 1.75 inches.

Prof. Cope also described a species of Rodent from the same beds under the name of *Steneofiber pansus*.

The molar teeth exhibit a regular gradation in width from the large anterior to the small posterior. In the mandibular series

the second and third are broader than long, the first and fourth longer than broad, and with an angle on the outer anterior side of the crown. There is an inflection or groove of the enamel on both inner and outer sides of the crown, and one enamel area before and one behind them on all excepting the last molar, where there are two in front. First nearly twice as large as last molar. Lower incisor with smooth enamel, and angulate on the extero-anterior border. Ramus stout. Length of molar series m. .016; length of first molar m. .005; width of first molar m. .004; width of last molar m. .0035; transverse diameter of incisor m. .004; depth of ramus at m. 2.012.

The regular diminution of the size of the teeth from front to rear is characteristic of this species; according to Dr. Leidy their reduction in size in the *S. nebrascensis* is more abrupt. The latter species is said to be of Miocene age.

DECEMBER 15.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-two members present.

Remarks on Fossils presented.—Prof. LEIDY remarked that the collection of fossils presented this evening by Lieut. E. Crawford, U. S. A., contained some interesting specimens. Among them are a number of tertiary vertebrate remains, which were found by Lieut. Crawford about ten miles from Red Cloud Agency, Nebraska. They mainly consist of fragments of bones and teeth, similar to those which he had previously ascribed to Titanotherium. The specimens indicate two individuals differing in size.

A lower jaw fragment, contains a last molar, like those represented in Plate XVI. of the Ancient Fauna of Nebraska, except that the external basal ridge is interrupted at the extreme outer part of the lobes of the crown. The fore and aft diameter of the latter has been about 3 inches and 7 lines. The thickness of the jaw just below the fore part of the tooth is little more than two inches.

A number of lower molars exhibiting evidences of having belonged together indicate a larger animal than the former. The last molar has lost its hinder lobe, but without this is as large fore and aft as in the specimen first indicated. When perfect, it was about $4\frac{1}{2}$ inches antero-posteriorly. In this likewise the basal ridge is interrupted at the extreme outer part of the lobes of the crown. The crown of the second molar, well-worn, is 35 lines fore and aft.

The three premolars have the same constitution as the molars, and rapidly diminish in size, passing forward in the series. The first premolar is 14 lines fore and aft; the second is 19 lines; and the third is 22 lines.

The lower series of three premolars and three molars has measured in its complete condition about 14 inches in length.

The isolated canine tooth, which I suppose to have pertained to the lower jaw, is a remarkable tooth, and has more of the usual characters of an incisor tooth. The crown is short, conical, and robust, and is bounded internally with a thick basal ridge. The length of the crown in its present worn condition is 13 lines; its width at base from without inwardly, about the same measurement, and from side to side 11 lines.

Of several imperfect thoracic vertebræ, one of the best preserved has the body over 2 inches long at the lower margin and about 3½ inches in breadth. The centre are strongly concavo-convex.

The head of a thigh-bone is about 4 inches in diameter, and has a large deep pit on its inner side for a terete ligament.

The distal end of a thigh-bone is 6 inches in transverse diameter, and the trochlea for the patella is over 3 inches wide.

Accompanying the Titanotherium remains are the shells of two turtles pertaining to the species *Stylemys nebrascensis*.

The remaining fossils of the collection are mainly cretaceous, and were obtained by Lieut. Crawford in various localities of Dakota. Among them are several large specimens of *Inoceramus problematicus* in nodules of iron stone, and fragments of *Baculites compressus*, together with several vertebræ of fishes, etc.

On the Characters of Symborodon.—Prof. COPE stated that the fossil mammalian remains from near the Red Cloud Agency, Dakota, presented this evening, probably belonged to a species of *Symborodon*. He remarked that that genus differs from *Titanotherium* (or *Menodus*) in the entire absence of inferior incisor teeth, and the close approximation of the canines. In the last-named genus the canine teeth of the lower jaw are widely separated by four well-developed incisors. Dr. Leidy had included species of *Symborodon* in his descriptions of *Titanotherium Proutii*; thus nearly or quite all of the portions of upper jaws described and figured by him as belonging to the latter genus, really pertained to the former, hence the erroneous assertion that *Symborodon* and *Titanotherium* are identical. The upper jaw and superior teeth, with the possible exception of one or two molars, of *Titanotherium Proutii* are unknown. He added that in a few days his figures of corresponding parts of the lower jaws of the two genera would appear (in Hayden's Report U. S. Geological Survey Terrs. 1873, Plate II.) and render the point clear.

On Dr. Leidy's "Correction."—Prof. Cope stated that his record of Dr. Leidy's views on the Fossil Reptilia of the Upper Missouri Lignite, contained in Hayden's Bulletin, U. S. Geological Survey Territories, No. 2, p. 7, which Dr. Leidy had deemed inaccurate,[1] expressed, as nearly as the case would admit of, the conclusions to

[1] Proceedings of the Academy, 1874, p. 73.

be found in Dr. Leidy's paper quoted. Thus, while it is true that it is there remarked of the remains of *Hadrosaurus occidentalis*, "I suspect to be a Dinosaurian, though they may have belonged to a Mammalian," he placed the genus "Thespesius," to which he referred the species, under the capital heading "Mammalia." The paper (*Proceedings Academy*, 1856, 312) was divided into the leadings, Mammalia, Chelonia, and Pisces, and the species numbered, and *Thespesius occidentalis* stands No. 4 under the first-named heading. In regard to the genus *Ischyrosaurus* which was also originally referred to the Mammalia, Dr. Leidy objected that his modified views had not also been quoted in the before-mentioned bulletin. Prof. Cope stated that he had already reprinted those later views in the Extinct Batractria and Reptilia of North America, p. 39, as follows; "although *I have supposed* the remains . . . to indicate . . . an animal allied to the manatee . . . *I have suspected* that they have belonged to an aquatic reptile unlike any known."

DECEMBER 22.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty members present.

Notices of Rhizopods.—Prof. LEIDY remarked that in the last number of the *Archiv für Mikroskopische Anatomie*, presented this evening, there was an interesting paper by F. E. Schulze, entitled Studies of the Rhizopods. With the exception of one new species, all of those represented in one of the accompanying plates, Taf. V., which had been previously described by others, he was familiar with, as common in the vicinity of Philadelphia. The genera and species are as follows: *Euglypha alveolata*, Dujardin; *E. compressa*, Carter; *E. globosa*, Carter; *Trinema acinus*, Dujardin; and *Cyphoderia margaritacea*, Schlumberger. Besides these, of nearly related forms, he had found *Euglypha spinosa*, Carter, and several other species apparently undescribed.

1. **Euglypha alveolata,** Dujardin. *E. tuberculata*, Duj.

? Difflugia setigera, Ehrenberg.

This species has an egg-shaped test, with over-lapping elliptical scales which in one focus appear hexagonal in outline. The oral scales are acute, and minutely denticulate. From two to six or more spines project from the sides of the fundus of the test. The largest specimens measure 0.132 mm. long, 0.08 mm. broad, with the mouth 0.028 mm. The smallest ones measured 0.08 mm. long, 0.04 mm. broad, with the mouth 0.016 mm. This species is common in the ponds and ditches in the neighborhood of the city.

2. **Euglypha compressa**, Carter. ? *Diffugia ciliata*, Ehrenberg.

Test flattened-ovoid; lateral border obtuse, and furnished with spines towards the fundus. Surface of test covered with scales as in the former species. Oral scales angular and denticulated. The largest specimens measured 0.1 mm. long, 0.06 mm. broad, and 0.03 wide or thick; with the mouth 0.052 broad, and 0.026 wide. Smaller ones measured 0.08 mm. long, 0.036 broad, and 0.024 wide.

Abundant at Absecom, N. J.

From the same locality I obtained larger specimens of the same form, but without spines, and also larger specimens covered with spines over three-fourths of the broad surfaces, as well as on the lateral borders. I propose, at a fitting opportunity, to investigate these still further, before expressing an opinion in regard to their identity with *E. compressa*.

3. **Euglypha spinosa**, Carter.

Test compressed-oval; lateral borders subacute, and furnished with narrow delicate dagger-like spines; mouth unusually broad, and narrow. Surface of test covered with oval scales, as in the former species, but the oral row does not project beyond the margin of the mouth. The specimens usually measure 0.112 mm. long, 0.072 mm. broad, and 0.036 wide; with the mouth 0.048 broad, and 0.008 wide.

This remarkable species is abundant at Absecom, and at Lake Hattacawanna, N. J.

4. **Euglypha cristata**, n. s.

Test oblong, or cylindro-ovoid, covered with elliptical scales as in the preceding species. With from four to six projecting angular, finely denticulated oral scales. With a tuft of six spines radiant from the very summit of the test. The largest specimens measure 0.05 mm. long by 0.018 broad, with the mouth 0.01 broad. The smallest are 0.04 long by 0.012 broad, with the mouth 0.008 broad.

A small and apparently well-marked species, common at Absecom, N. J.

5. **Euglypha globosa**, Carter

Test globose or oval, with a short neck or rim to the mouth. Surface covered with circular scales. The smallest species, approaching in character the next genus. Length from 0.028 to 0.048, breadth from 0.02 to 0.04 mm.

Common at Absecom and Lake Hattacawanna, N. J.

6. **Euglypha brunnea**, n. s.

Test flattened-spheroidal, brown in color, covered with imbricate oval scales. Mouth transversely elliptical, with the edges always irregular or ragged. Length of largest specimens 0.1 mm., breadth 0.088, and width 0.036, with the mouth 0.04 broad.

Length of smallest specimen 0.08 mm., breadth 0.072 mm., width 0.028 mm., with the mouth 0.028 mm. broad, and 0.008 mm. wide.

This species is among the most frequent at Absecom, at Longacoming, and at Lake Hattacawanna, N. J.

7. **Trinema acinus**, Dujardin. *Difflugia enchelys*, Ehr. *Euglypha pleurostoma*, Carter. *Euglypha enchelys*, Wallich.

Test ovoid, often contracted towards the narrow extremity, beneath which is the circular depressed mouth. Surface of test covered with circular scales. Length of largest specimens 0.1 mm. long, and 0.06 broad, with the mouth 0.024 broad. The smallest specimens measure 0.036 long, by 0.016 broad.

This species is common everywhere, small ones having been found in moss in the crevices of the bricks of the city pavements, in shaded places. The largest specimens I have found in Absecom Pond.

8. **Cyphoderia margaritacea**, Schlumberger. *Euglypha curvata*, Perty. *Euglypha margaritacea*, Wallich. *Lagynis baltica*, Schultz.

Test curved pyriform, membranous, minutely and hexagonally areolated. Mouth terminal, oblique, circular. The largest specimens measured 0.132 mm. long, 0.06 broad, with the mouth 0.02 wide; the smallest specimen was 0.108 mm. long., 0.04 broad, with the mouth 0.016 wide.

The species I found in a spring at Darby Station, near Philadelphia.

To this same species I suspect the following forms belong, described by Ehrenberg: *Difflugia Lagena*, *D. adunca*, *D. alabamensis*, *D. ampulla*, and *D. uncinata*.

9. ? **Corycia**, Dujardin; ? *Pamphagus*, Baily; ? *Pleurophrys* **scutiformis**, Hertwig and Lesser; perhaps *Pleurophrys* **cylindrica**, Claparede and Lachmann.

Test thin, hyaline, membranous, colorless, structureless, flattened ovate or scutiform, with acute borders, with an acute, subacute, or transversely obtuse fundus. Mouth small, inconspicuously defined, sometimes with the appearance of a C-like lip. Pseudopods long, filiform, acutely branching and radiant from the mouth. Protoplasm clear, granular, with a large nuclear vesicle, and one or more contractile vacuoles. The animal moves slowly with the test erect, and it feeds on diatomes, desmids, etc. The largest specimens measured were 0.1 mm. long, by 0.06 broad, and 0.02 wide; the smallest 0 04 long, 0.028 broad, and 0.012 wide.

Found in a spring at Darby Station, on the Westchester R. R., Pa., and at Kirkwood Pond, on the Camden and Atlantic R. R., New Jersey.

This creature agrees well with the figures and description of *Plagiophrys scutiformis* of Hertwig and Lesser (*Archiv f. Mik. Anat.*, 1874, Taf. iii., figs. ii. a, b, c), but in size it rather accords with the *Plagiophrys cylindrica* of Claparede and Lachman.

Weathering of Rocks.—Prof. PERSIFOR FRAZER, Jr., remarked that the igneous rocks in the vicinity of Gettysburg, Pa., present some curious phases of weathering. The ridge along which our forces were disposed during the battle at that place, consists of a syenite which at a point opposite the position of our army's extreme left wing (or Round Top) has broken off, and lies in huge bowlders piled up with great irregularity, and presenting surfaces sometimes many hundred yards in area. These surfaces are sometimes furrowed by channels cut into them by running water, and intersecting in all directions so as to present the general appearance of a Cyclopean wall. The furrows are about an inch in depth, and the raised surfaces which they separate, though slightly discolored, present no signs of perfect disintegration. The similitude to a coarse wall built up of fragments of all sizes, is striking and deceptive even on a close examination.

In some cases, this entire furrowed surface is detached by a fracture, which separates it as a mask from the normally constituted mass beneath it, and in a few instances there were observed two such shells one beneath the other.

This gave the whole rock a concretionary appearance which was remarkable for the tolerably constant thickness of the shells, considering the want of homogeneousness of the rock. It raises an interesting question of how rocks may assume this character by weathering alone.

DECEMBER 29.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

Isaac S. Williams, R. M. Girvin, M.D., George D. McCreary, J. Elmore McCreary, and Robert B. Cruice, M.D., were elected members.

Capt. J. H. Mortimer and M. C. Cook, of London, were elected Correspondents.

The following reports were read and referred to the Publication Committee:—

THE LIBRARIAN'S REPORT.

The Librarian respectfully reports that 1660 additions have been made to the library during the year 1874, being an excess of 324 above the number reported for 1873.

Of these 235 were volumes, 1416 pamphlets and parts of periodi-

cals, and 9 maps, charts, etc.; 1207 were octavos, 388 quartos, 44 folios, 12 duodecimos, and 9 maps.

They were derived from the following sources:—

Societies	801	Geo. H. Cook	2
Editors	304	Engineer Department, U. S. A.	2
Authors	125	Dr. F. A. Hassler	1
Wilson Fund	72	Geo. W. Tryon, Jr.	1
Isaac Lea	25	Dr. J. H. Slack	1
Department of the Interior	21	J. H. Redfield	1
Geological Survey of Sweden	15	Dr. Asa Gray	1
Publishers	14	Owen Biddle	1
Prof. Alex. Agassiz	12	Geological Survey of New Zealand	1
Smithsonian Institution	10	Commissioners of Public Charity, Pa.	1
Geological Survey of India	9	Trustees of Liverpool Library	1
Thomas Meehan	7	Trustees of N. Y. University	1
Miss Amelia Priestman	6	Pennsylvania R. R. Co.	1
Minister of Public Works, France	5		
S. S. Haldeman	3		

Two hundred and sixteen were purchased.

The additions to the library were distributed to the several departments as follows:—

Journals and Periodicals	1110	Religion	20
Geology	89	Physical Science	19
Conchology	69	Anatomy and Physiology	18
Botany	64	Mineralogy	16
Medicine	42	Voyages and Travels	11
General Natural History	42	Ichthyology	9
Bibliography	38	Herpetology	4
History and Statistics	32	Education	4
Entomology	23	Mammalogy	3
Ornithology	22	Chemistry	3
Helminthology	22		

181 volumes, including 20 volumes of entomological pamphlets, have been bound.

The copying of the Geological Catalogue, which had been revised and arranged at the end of 1873, has been completed. A general card catalogue of the entire library has been commenced, and the titles of all the volumes and pamphlets in the departments of Entomology and Botany, the former numbering 1067, and the latter 1024, have thus been recorded. The works in these departments have been numbered, so that their position on the shelves is indicated by the entry on the card, and the advantages of this arrangement have been found to be so great that the same system of numbering and cataloguing will be extended to the other departments of the library as rapidly as may be.

One hundred and thirty-one letters have been written during the year to editors and societies, asking for a supply of such parts and volumes as were necessary to complete the Academy's set of their publications. In several cases the parts asked for have been received already, and a large number of favorable answers may be confidently expected during the coming spring.

All of which is respectfully submitted,

EDWARD J. NOLAN, *Librarian.*

REPORT OF THE CURATORS.

Little has been done during the past year in the arrangement of the Museum of the Academy. Mr. Charles E. Parker, one of the Curators, went over the alcoholic specimens, renewing the alcohol, and otherwise securing their preservation.

The contributions to the Museum during the year are as follows:—

Mammals.—A Bat from Fort Randall, Dakota, presented by Dr. W. T. Thackeray, U.S. A.; a Flying Squirrel from Texas, by S. B. Buckley; a large variety of the Cat, by A. G. B. Hinkle; a monstrous Pig, by W. Cox; the skin of an Ant-eater, by an unknown donor.

Dr. A. M. Owen U.S.N., presented five human skulls from the Fiji, Marquesas, and Sandwich Islands.

Skeletons of a Cavia and a Muskrat were presented by Jacob Geismar.

Birds.—Nineteen specimens, thirteen species of bird skins were presented by a unknown donor. A small collection of bird skins, from Nicaragua, was presented by Dr. John F. Bransford, U. S. N.

A collection of North American birds' eggs, 147 specimens of 74 species, was presented by Mr. E. Dickenson, of Springfield, Mass. A collection of 69 species of birds' eggs and nests was presented by the Smithsonian Institution.

Jacob Geismar presented the skeleton of the Great-horned Owl, and the skull of a Turkey.

Reptiles, Amphibians, and Fishes.—Seven serpents from the Marquesas, South Sea Islands, and Australia, were presented by Dr. A. M. Owen, U. S. N. Two Lizards from Armenia were presented by Rev. G. W. Coan, D.D. A large jar of South American

Reptiles was presented by an unknown donor. An Amblystoma, from Dakota, was presented by W. T. Thackeray.

Six specimens of a viviparous fish from California were presented by Major F. G. Smith; four species of fishes from San Domingo were presented by Wm. M. Gabb; and a File-fish from Atlantic City was presented by Joseph Wilcox.

General Collections.—A large and miscellaneous collection of fishes, mollusks, insects, crustaceans, echinoderms, etc., from the Pacific Coast of America and Islands, was presented by Dr. Wm. H. Jones, U. S. N.

A collection in nine jars, of reptiles, fishes, mollusks, insects, myriapods, radiates, etc., from Nicaragua, was presented by Dr. John F. Bransford, U. S. N.; six vials of insects, from South America, were presented by an unknown donor; a collection of 34 alcoholic specimens of pelagic mollusks, bryozoa, crustaceans, etc., was presented by Capt. John H. Mortimer.

Mollusks.—A Pholas in bored rock, from Torbay, England, was presented by Mr. Browse. A Boltenia, from Maine, was presented by W. L. Mactier; specimens of Pecten Magellanicus, from Connecticut, by Dr. Leidy; and six species of South American land shells, by an unknown donor.

For other contributions in this department, see the Report of the Conservator of the Conchological Section.

Articulates.—Six vials of South American insects were presented by an unknown donor. A small collection of insects and spiders, in alcohol, from Fort Randall, Dakota, was presented by Dr. W. T. Thackeray, U. S. A.

Two species of Pagurus, from Connecticut, were presented by Dr. Leidy, and a Scolopendra, and a Tarantula, from the West Indies, by Dr. John L. Le Conte.

Radiates and Protozoa.—Two species of Echini, from Connecticut, were presented by S. F. Clark; two species of Asterias, from the same place, by Dr. Leidy; an Actinia, and a Holothuria, from Maine, by Wm. L. Mactier; and a Coral, from the Sandwich Islands, by Dr. Thomas H. Streets.

Sixteen species of Sponges, from the Cuyades Islands, were purchased.

Fossils.—A collection of cretaceous fossils, consisting of Inoceramus, Baculites, other molluscan remains, remains of fishes, etc., from several localities in Dakota, and also a collection of rocks

and tertiary fossils, mainly consisting of remains of Titanotherium Proutii, and Stylemys Nebrascensis, from near Red Cloud Agency, Nebraska, was presented by Lieut. E. Crawford, U. S. A.

Fourteen cretaceous fossils, from Texas, were presented by Dr. A. H. Graham. Three cretaceous vertebrate fossils, from New Jersey, were presented by W. H. Dougherty. A small collection of eocene fossils, consisting of remains of fishes, shells, etc., from Vincentown, N. J., was presented by Col. T. M. Bryan. A molar tooth of a Mastodon, from the same neighborhood, was presented by the same gentleman. A collection of post-tertiary fossil shells, from Hennepin Co., Minn., was presented by Mr. Thomas T. Smith.

A large slab of red sandstone with foot-tracks, and a fragment of a fossil tree, from Portland, Conn., were presented by William Struthers. A slab of sandstone with fucoid remains, from Dauphin Co., Pa., was presented by Allen Walton.

Plants.—A collection of Californian and East Indian plants, and one of Anderson's Willows, were presented by Prof. Asa Gray.

A collection of Palmer's plants of Arizona and Southern California was presented by the U. S. Department of Agriculture. A collection of plants of Colorado and Wyoming, made by Messrs. Coulter, Brandajee, and Poulter, was presented by Prof. Thomas C. Porter.

Fifteen species of Arctic plants, from the voyage of the Polaris, were presented by Dr. E. Bessels.

Eighty-six Californian plants were presented by Miss S. P. Monks; 8 species of Brazilian ferns, by Mr. J. H. Redfield; and 1 species of a Californian plant, by Rachel L. Bodley.

Minerals.—Specimens of Quartz, Topaz, Feldspar, Cyanite, Hisingerite, Tourmaline, Pyrite, 3 Scapolites, 2 Tremolites, Staurolite, Stilbite, and Calcite, were presented by Mr. Joseph Jeanes.

Specimens of Amethyst, Oligoclase, Tetrahedral Blende, Biotite, Analcime, Stilbite, Mesolite, Acadialite, Corundum and Spinel, and Staurolite, were presented by Joseph Wilcox.

Specimens of Cacoxene, Emplectite, Scapolite, and Staurolite, were presented by Clarence S. Bement.

Other specimens presented are as follow: Seven polished Marbles, by Geo. W. Thompson; 2 Wulfenites, from Nevada, by Jas. P. Carson; Amethyst, and Feldspar with Quartz, from Siberia, by Dr. J. H. Linn; a large Stalactite, from Crystal Cave, Berks Co.,

by Mr. S. D. F. Kohler; Amber, from New Jersey, by Dr. H. O. Hyatt; do., by Col. T. M. Bryan; Salt, by H. T. Darlington; Breunerite, by C. F. Parker; Livingstonite, from Mexico, by Sr. Mariano Barcena; and Limonite, Analcime, Stilbite, Heulandite, and Cacholong, by Dr. Leidy.

The collection of Minerals of the late Dr. Adam Seybert has been deposited in the Academy by Mr. Henry Seybert.

Respectfully submitted by

JOSEPH LEIDY,
Chairman of Curators.

REPORT OF RECORDER OF BIOLOGICAL AND MICROSCOPICAL SECTION.

December 7th, 1874.

In reviewing the events of our microscopical year, I think we may find just cause for mutual congratulation, in the fact, that although the number of original papers presented before the Section has been less than on some previous occasions, yet we have in the past twelve months done more than almost ever before, to popularize a knowledge of the wonders of microscopic investigation, to interest the community in our special branch of natural science, and to convince the citizens of Philadelphia that we form a *living active* department, of an Association well worthy of more general encouragement, as well as of more bountiful pecuniary aid.

These important objects have of course been chiefly advanced by the successful management of our two semi-annual Exhibitions, the latter, and more satisfactory of which, was contributed to by eminent microscopists of New York and Boston, as well as of Philadelphia, and was witnessed by nearly one thousand of our citizens. "The microscopes" (to quote from the report of Dr. J. H. McQuillen, Chairman of the Committee), "forty in number, were arranged on tables in three rooms of the library, and the principal, if not the only drawback of the exhibition, was the contracted space and the impossibility of properly accommodating the large number of persons present."

During the year original communications were presented by Dr. James Tyson, "On a Set of Barth's Classified Specimens in Pathological Anatomy," by Dr. J. Gibbons Hunt, on his novel and

beautiful method of "Double Staining Vegetable Structures," by which certain portions of a plant may be colored green *in situ* without dissection, whilst other parts are tinted violet; by Mr. D. S. Holman, on his very ingenious "Siphon Life Slide;" and by J. G. Richardson, "On the Supposed Hepatic Structure in the Connecting Band of the Siamese Twins," "On the Value of High Powers in the Diagnosis of Blood Stains," and "On the Performance of Two One-Fiftieth Objectives."

Most of these communications gave rise to copious discussions among our members, eliciting a variety of opinions in regard to the subject under consideration, and it is to be hoped materially advancing the cause of science, by the establishment of some new and positive facts. The debates, as reported for the columns of the *Philadelphia Medical Times*, have possessed so much general interest to the Medical profession, that they continue to be warmly welcomed by the editors of that valuable journal.

The improved method of announcing the date of meeting, with the title, etc., of some communication to be made and discussed, by the employment of the United States Postal cards, has contributed largely to the interest of our sittings, and at a decreased expense.

All of which is respectfully submitted by

Jos. G. Richardson, *Recorder.*

REPORT OF CONSERVATOR OF CONCHOLOGICAL SECTION.

The Conservator of the Conchological Section respectfully reports that the following additions have been made to the Cabinet during the year 1874:—

Jeanes., Jos. Fourteen species of Terrestrial Mollusks, from Mauritius and Madagascar.

Smithsonian Institution. Eight species of fresh-water shells from Colorado.

Lea, Isaac. *Anodonta Leonensis*, Lea; *A. Ferussaciana*, Lea, from Fort Hayes, Kansas, and *Ancylus*, from Florida.

Bransford, Dr. J. F. Several species of Mollusks from Nicaragua.

JONES, Dr. WM., U. S. N. Mollusks in alcohol from the Pacific Coast of America.

LEIDY, Dr. JOS. Specimens of *Pecten Magellanicus* from Noank, Conn.

MORTIMER, Capt. J. H. Thirty-four alcoholic specimens of Oceanic Mollusca beautifully prepared.

Sixteen species of Terrestrial Mollusks, from Mauritius and Madagascar, were purchased.

At the last meeting of the Academy the reception of the Terrestrial Shells of the Swift Collection was announced, and the thanks of the Academy were ordered to be conveyed to Mr. Thomas Bland, for the care exercised by him in labelling, arranging, and forwarding the specimens. The remaining part of the collection is now in the hands of Prof. O. A. L. Mörch, of Copenhagen, to whom it had been sent for determination. The two portions form the finest collection of West Indian shells in existence, and when arranged in our Cabinet will be a valuable addition to a collection which is already one of the largest in the world.

Apart from arranging the specimens received during the year, the work of the Section has been confined to the preparation of a reference index to the collection, the arrangement of which, as I had the pleasure of reporting last year, was completed during 1873. This index, embracing 1574 generic and family names, was rendered necessary by the extent of the collection, and has been found of great service by those wishing to examine particular species.

All of which is respectfully submitted,

EDW. J. NOLAN, M.D., *Conservator.*

The election of Officers for 1875 was held in accordance with the by-laws, with the following result:—

President . . .	W. S. W. Ruschenberger, M.D.
Vice-Presidents . .	Jos. Carson, M.D., John L. LeConte, M.D.
Recording Secretary .	Edw. J. Nolan, M.D.
Corresponding Secretary	Edw. D. Cope.
Treasurer . . .	Wm. C. Henszey.

Librarian . . .	Edw. J. Nolan, M.D.
Curators . . .	Jos. Leidy, M.D., Wm. S. Vaux, Geo. W. Tryon, Jr., Chas. F. Parker.
Publication Committee .	Jos. Leidy, M.D., Wm. S. Vaux, Geo. W. Tryon, Jr., Edw. J. Nolan, M.D., W. S. W. Ruschenberger, M.D.
Council	John L. LeConte, M.D., R. S. Kenderdine, M.D., Edw. S. Whelen, Robert Bridges, M.D.
Finance Committee .	Aubrey H. Smith, Wm. S. Vaux, Robert Bridges, M.D.

ELECTIONS DURING 1874.

MEMBERS.

January 27.—Geo. De B. Keim, Henry Tagg, Charles S. Whelen, Henry A. Muhlenberg, Charles W. Macfarlane.

March 3.—General Isaac J. Wistar, General William Lilly, Samuel J. Reeves, John F. Weightman, M.D., John T. Sharpless, M.D., John B. Pearse, William M. Bowron.

May 5.—Charles P. Perot, Reuben Haines, G. Schwarz, Galloway C. Morris, Dr. John M. Coles, U. S. N., Hugh Hamilton, M.D.

May 26.—Thos. Hockley, William A. Stokes, John Shallcross, Alfred G. Reed, J. E. Kingsley, Louis A. Godey, Richard J. Dunglison, M.D.

October 7.—Karl Seiler, M.D., Charles Baeder, Charles B. Baeder, William Adamson, Wm. B. Adamson, George Washington Smith, J. E. Mitchell, Charles Parrish, Hon. John Leisenring, Charles Dutilh, Mrs. Amelia D. Hockley, Charles W. Poultney.

October 27.—Dr. A. M. Owen, U. S. N., John B. Robinson, U. S. N., Daniel Maul, Mrs Elizabeth V. Graham, Charles H.

Howell, James Dougherty, John Rothermel, Wm. Macdowall, W. S. Bissel.

November 24.—Miss Adeline S. Tryon, Paul Beck, George Gerry White, James G. Pease, Prof. Geo. F. Barker, W. J. Hoffman, M.D., Joseph D. Potts, David E. Dallam, W. W. Jefferis.

December 29.—Isaac S. Williams, R. M. Girvin, M.D., Geo. D. McCreary, J. Elmore McCreary, Robt. B. Cruice, M.D.

CORRESPONDENTS.

January 27.—James Stevenson, U. S. Geol. Survey.

May 5.—Don Antonio del Castillo, of Mexico; Don Mariano Bárcena, of Mexico; Don José Joaquin Arriago, of Mexico.

October 7.—A. L. Siler, of Osmer, Utah; J. Fayrer, M.D., of Calcutta; Peter MacOwan, of Somerset, South Africa; H. W. Hollenbush, of Reading.

October 27.—Dr. A. E. Carothers, of Saltillo, Mexico.

December 29.—Capt. J. H. Mortimer; M. C. Cook, of London.

CORRESPONDENCE OF THE ACADEMY.

For 1874.

January.—Boston Society of Natural History, acknowledging receipt of Proceedings.

Davenport Academy of Natural Sciences, soliciting a copy of the Constitution and By-Laws of the Academy.

Literary and Philosophical Society of Liverpool, with Proceedings and soliciting the publications of the Academy in exchange.

H. W. Hollenbush, accompanying a stalactitic formation.

H. Dexter, in relation to bust of Prof. L. Agassiz.

February.—Linnean Society of London, acknowledging receipt of publications.

American Institute of Mining Engineers, Philadelphia, accompanying Transactions.

W. P. Breed, with resignation as a member.

Révue Scientifique, Paris.

Société Royale des Sciences à Upsal.

Die Kaiserliche Akademie der Wissenschaften in Wien, accompanying publications.

March.—Lyceum of Natural History of New York;

Essex Institute, Salem, Mass;

Literary and Philosophical Society of Liverpool; severally acknowledging receipt of publications.

S. V. Summers, in relation to an Entomological Survey.

A. Morgan, soliciting an exchange of publications.

J. F. Weightman, acknowledging receipt of notice of election as a member.

Eugene C. Skinner, soliciting a copy of the Constitution, etc., of the Academy.

I. J. Wistar, acknowledging receipt of notice of election as a member.

Middlesex Mechanics' Association, Lowell, Mass., stating the object of the association.

Department of Agriculture, Washington, D. C., accompanying botanical specimens.

Die Naturforschende Gesellschaff of Basel.

Die Physicalisch-Medicinische Gesellschaft in Würtzburg.

Société des Sciences Naturelles de Neuchatel.

Der Naturwissenschaftliche Verein für das Fürstenthum Lüneburg.

Directeur du Jardin Impérial Botanique, St. Pétersbourg.
Sociedad Mexicana de Historia Natural, Mexico.
Naturwissenschaftliche Verein zu Bremen.
Königliche offentliche Bibliothek zu Dresden.
Die Kaiserliche Universitäts und Landes Bibliothek, Strasburg.
Das Bibliothekariat der Königliche Bayerische Akademie der Wissenschaften.
Société Entomologique de Russie, St. Petersburg.
Die Königliche Gesellschaft der Wissenschaften zu Göttingen.

April.—Belfast Nat. History Society;
Lyceum of Natural History, New York;
Yale College, New Haven; severally acknowledging receipt of publications.
Hurd & Houghton, with circular.
Geological Survey of India, Calcutta, with publication.
Dorpater Naturforschende Gesellschaft, Dorpat.
Die Königlich Sächsische Gesellschaft der Wissenschaften.
Konigl. Universitäts Bibliothek, Kiel.
M. Mouillefarine, Paris.
Dr. Fred. Stein, Berlin.

May.—American Acad. of Arts and Sciences, Boston;
Philosophical Society of Glasgow;
Lyceum of Natural History, New York;
Royal Society of London;
Essex Institute, Salem; severally acknowledging receipt of publications.
D. G. Brinton, with resignation as a member.
Smithsonian Institution, Washington, soliciting a loan of specimens relating to the Ethnology of the Esquimaux.
Liverpool Free Public Library, Museum, and Gallery of Arts, with publication.
Hammond Dugan, in relation to a picture.
Université Catholique de Louvain.
Académie Royale des Sciences de Lisbonne.
Académie Royale des Sciences à Amsterdam.
L'Institute Royal Météorologique des Pays-Bas, à Utrecht.
Société Hollandaise des Sciences à Haarlem.
Auftrag der Naturforschenden Gesellschaft, Zürich.

June.—Royal Geological Society, Dublin;
Harvard College, Cambridge;
Essex Institute, Salem; severally acknowledging receipt of publications.
New Jersey Commissioners of Fisheries, Bloomsbury, N. J., with an invitation to view the mode of hatching spawn.
Smithsonian Institution, with specimens for museum, and acknowledging receipt of publications.
Prof. James Orton, in reference to a bill for proceedings.
Wm. Holden, desiring a copy of Hentz' Notice concerning a spider.

Die Oberhessiche Gesellschaft für Natur- und Heilkunde.

L'Institute Royal Méteorologique des Pays-Bas, à Utrecht.

Der Naturforscher-Verein zu Riga.

Archives du Musée Tyler, à Haarlem.

Der Bibl. Kais. Akademie der Wissenschaften in Wien.

Société Hollandaise des Sciences, à Haarlem.

July.—Magyar Tudományos Akadémia, Pest, with publications.

B. Wilder, Jabez Hogg, Jos. D. Hooker, M.D., severally acknowledging receipt of notice of election as correspondents.

Dr. Macomber, resignation of membership.

Wesley Creal, in relation to a Mastodon's tooth.

Yale College, New Haven, acknowledging receipt of publications.

Antonio del Castillo, acknowledging election as correspondent.

Der Offenbacher Verein für Naturkunde.

Académie Royale des Sciences, des Letters, et des Beaux-arts de Belgique, transmitting publication.

August.—Cambridge University;

Zoological Society of London;

Leed's Philosophical and Literary Society;

British Museum; severally acknowledging receipt of publications.

Literary and Philosophical Society of Liverpool, with publications.

Literary and Philosophical Society of Manchester, with publications.

Anales del Museo Publico de Buenos Aires.

Academia National de Ciencias Exactas, Buenos Aires.

Der Senckenbergischen Naturforschenden Gesellschaft, zu Frankfurt a. M.

Bureau de la Recherche Geologique de la Suede.

Naturforcher-Verein zu Riga.

Mariano Barcena, Mexico.

September.—New York State Library, Albany, with publications.

Dr. J. Henle and Jose Joaquin Arriago, Mexico, acknowledging election as correspondents.

Det Kongelige Danske Videnskabernes Selskab, Kjobenhavn.

October.—New York Lyceum of Natural History, acknowledging receipt of publications.

Thos H. Streets, accompanying a specimen of coral.

A. L. Siler, acknowledging receipt of notice of election as correspondent.

Société Linnéenne de Bordeaux, with publications.

November.—Smithsonian Institution, Washington;

Naturforschende Gesellschaft of Basel;

Magyar Tudományos Akadémia;

Belfast Museum; severally acknowledging receipt of publications.

Konigl. Bayerischen Universitäts Bibliothek, acknowledging receipt of publications and desiring deficiencies.

Thos. Frazer, acknowledging receipt of notice of election as correspondent.

Die Konigl. Böhmische Gesellschaft der Wissenschaften.

Auftrag des Aerztlichen Verein in Frankfurt.

Das Museum des Königreiches Böhmen.

Konigliche Universitätsbibliothek, Wurtzburg.

Der Bibliothekar der K. Bayerischen Akademia der Wissenschaften.

Die Konigliche Gesellschaft der Wissenschaften zu Göttingen.

Der Verwaltungs-Ausschuss des Ferdinandeums zu Innsbruck.

Physicalisch-Medicinische Gesellschaften in Wurtzburg.

Der Naturforschende Verein in Brünn.

Verein für Vaterländische Naturkunde, in Württemberg.

Muséum d'Histoire Naturelle, Paris.

Mariano Bárcena, acknowledging election as correspondent.

December.—Smithsonian Institution, Washington;

New York Lyceum of Natural History;

Yale College; severally acknowledging receipt of publications.

Chicago Academy of Sciences, acknowledging receipt of specimens.

State Normal School, Mansfield, Tioga Co., Pa., desiring Geological specimens for a Cabinet.

Académie des Sciences et Letters de Montpelier, asking for a supply of deficiencies.

Dr. Wm. B. Corbit, with resignation as a member.

Robt. Ridgway, desiring permission to study and to catalogue the Falconidæ.

W. J. Hoffman, desiring to become a member.

R. J. Dunglison, James O. Pease, Geo. Gerry White, severally acknowledging receipt of notice of election as members.

Bataafsch Genootschap der Prœfondervindelijke Wijsbegeerte te Rotterdam.

Congrès International des Sciences Géographiques, Paris.

Société Hollandaise des Sciences à Haarlem.

Société Entomologique de Belgique.

Prof. Peter MacOwan, Somerset, S. Africa, acknowledging election as correspondent.

Which is respectfully submitted by

E. D. COPE,
Corresponding Secretary.

ADDITIONS TO THE LIBRARY, 1874.

Agardh, J. G. Til Algernes Systematik. Nya bidrag af J. G. Agardh. From the Author.

Agassiz, Prof. Louis. Catalogus Systematicus Ectyporum Echinodermatum Fossilium Musei Neocomensis. Neocomi Helvetorum, 1840.

Description des Echinodermes Fossiles de la Suisse; 1re et 2e Partie. Neuchatel, 1839.

On Ichthyological Fauna of the Pacific Slope of North America.

Contemplations of God in the Kosmos.

On the Principles of Classification in the Animal Kingdom.

On Extraordinary Fishes from California.

On the Origin of Species.

The Primitive Diversity and Number of Animals in Geological Times.

Contributions to the Natural History of the Acalephæ of North America.

Iconographie des Coquilles Tertiaires. Neuchatel, 1845.

Histoire Naturelle des Poissons d'Eau Douce de l'Europe Centrale. 2e Livr. Neuchatel. From Alex. Agassiz.

Allen, J. A. Notes on the Mammals of portions of Kansas, Colorado, Wyoming, and Utah.

Metamorphism produced by the Burning of Lignite Beds in Dakota and Montana.

Geographical variations in North American Birds.

On the Geographical variation in Color among North American Birds. From the Author.

Anderson School of Natural History at Penikese Island, Organization of the. Report of the Trustees for 1873. From the Trustees.

Austin, Coe F. Hepaticæ Boreali-Americanæ. Closter, N. J., 1873. From the Author.

Baird, S. F. United States Commission of Fish and Fisheries. Report on the Condition of the Sea Fisheries of the South Coast of New England in 1871 and 1872. Washington, 1873. From the Author.

Baird, S. F., T. M. Brewer, R. Ridgway. A History of North American Birds. Vols. I., II., and III., Land-Birds. Boston, 1874. Purchased.

Baker, Sir Saml. White. Ismailia; A Narrative of the Expedition to Central Africa for the Suppression of the Slave Trade organized by Ismail, Khedive of Egypt. New York, 1875. Purchased.

Bancroft, Hubert Howe. The Native Races of the Pacific States of North America. Vol. I., Wild Tribes. New York, 1874. Purchased.

Barcena, Mariano. Viaje a la Caverna de Cacahuamilpa. Mexico, 1874. From the Author.

Barratt, J., M D. Fossil Wonders of a former World. From the Author.

Baumhauer, E. H. von. Sur un Metéorographe Universel destiné aux Observatoires Solitaires. Harlem, 1874. From the Author.

Bechler, G. R. Map of the Lower Geyser Basin on the Upper Madison River. From U. S. Geol. Sur. of Territories.

Belt, Thos. The Naturalist in Nicaragua. London, 1874. Purchased.

Benson, Lawrence S. My visit to the Sun ; or, Critical Essays on Physics, Metaphysics, and Ethics. Vol. I., Physics. New York, 1874. From the Author.

Binney, W. G. Notes on American Land Shells. Vol. II. Part II. 8vo. Burlington, 1874. From the Author.

Bland, Thos. Description of a new species of Helix, and Note on H. Mobiliana, Lea. From the Author.

Bland, Thos., Binney, Wm. G. On the Lingual Dentition and Anatomy of Achatinella and other Pulmonata.

Bosgoed, D. Mulder. Bibliotheca Ichthyologica et Piscatoria. Harlem, 1874. From the Author.

Bouvier, A. Catalogue des Collections Ornithologiques en vente chez A. Bouvier. Paris, 1874. From the Publisher.

Brady, Geo. Stewardson, D. Roberts. Contributions to the Study of the Entomostraca. Two pamphlets. Aug. 1873, and Feb. 1874. From the Authors.

Brefeld, Dr. Oscar. Botanische Untersuchungen über Schimmelpilze. II. Heft. Leipzig, 1874. Purchased.

Brenchley, Julius L. Jottings during the Cruise of H. M. S. Curacoa among the South Sea Islands in 1865. 8vo. London, 1873. Purchased.

Broadhead, G. C., F. B. Meek, B. F. Shumard. Reports on the Geological Survey of the State of Missouri, 1855–1871. 1 vol. 8vo. Jefferson City, 1873.

Geological Survey of Missouri. Preliminary Report on the Iron Ores and Coal Fields from the Field Work of 1872. 1 vol. 8vo. New York, 1873. With Atlas of 9 Maps. Folio. From G. C. Broadhead.

Bronn, Dr. H. G. Klassen und Ordnungen des Thier Reichs. 5er Band, 17 Lief ; 6er Band, 5 Abth, 2 and 3 Lief. Leipzig, 1874. From the Wilson Fund.

Brown, Thomas. The Conchologist's Text-Book. Glasgow, 1837. From Dr. Hassler.

Bruce, James. Travels to discover the Source of the Nile in the years 1768–1773. Second Edition. Vol. VIII., containing the plates and maps. Edinburgh, 1805. From Miss Amelia Priestman.

Bulard. Observations Météorologique, Janvier et Février 1871. Alger, 1874. From R. S. Mason.

Observatoire d'Alger. 1re Partie Panorama Météorologique du Climat d'Alger. Observations Météorologiques. 33 Tableaux, 1 Tableau Graphique. Jan. 1872. 2 folio pamphlets and 1 large chart. From R. S. Mason.

Observatoire d'Alger Résumé Météorologique des Deuxième et Troisième Trimestres 1868 et Mars, Avril et Mai, 1871. 2 tracts. From R. S. Mason.

An Abstract from the Meteorological Observatory of Algiers. From Richard S. Mason.

Sécheresse et Inondations. Nécessité de Reboisement. Alger 1872. From R. S. Mason.

Bureau of Statistics of Labor and Agriculture, First Annual Report of the, 1872–73. Harrisburg, 1874. From the Bureau.

Bütschli, Dr. O. Beiträge zur Kenntniss der freilebenden Nematoden. Dresden, 1873. Purchased.

Cabrera, Florencio. Descubrimiento y Estudio del Bismuto. From the Author.

Calkins, W. W. The Land and Fresh-water Shells of La Salle Co., Ill. Chicago, 1874. From the Author.

Carli, Luigi. Risposta all lettera del Rev. P. Gio. Maria Cornoldi sul Colera e suoi rimedi.

Osservazioni sul progetto di Prosciugamento delle Valli di Comacchio.
Alcune parole di Comforto al Comuni di Massafiscaglia, etc.
Apologia del Beneficio parrocchiale in Specie di Lagosanto. From the Author.

Catalogue of the Liverpool Free Public Library, First Supplement to the. 1873. From the Trustees.

Catalogue of the Museum of Comparative Zoology at Harvard College. No. VII. Revision of the Echini. Text, Part III.; Plates, Part III. and IV. Cambridge, 1873. From the Museum.

Catalogue of the Library of the Surgeon General's Office U. S. A. 3 vols. 4to. Washington, 1873. From the Surgeon General.

Catalogue of the Photographs of the U. S. Geo. Surv. of the Territories. Washington, 1874. (Misc. Publ. No. 5.) From the Survey.

Central Colorado. Preliminary Map of U. S. Geol. Surv. of Territories.

Chantres, Ernest. Projet d'une Légende Internationale pour les Cartes Archéologiques préhistoriques. Lyon, 1874.
Les Faunes Mammalogiques tertiaire et quaternaire du Bassin du Rhone. Lyon, 1874.
L'Age de la Pierre et l'Age du Bronze en Troade et en Grece. From the Author.

Chittenden, Geo. B. U. S. Geol. Surv. of the Territories. Miscellaneous Publ. No. 6. Meteorological Observations made during the year 1873 and the early part of the year 1874, in Colorado and Montana Territories. Washington, 1874. From the Dep. of Interior.

Cobbold, T. Spencer. Fatal Epidemic affecting Ponies. Parasitism in Australia.
Observations on rare Parasites from the Horse.
Parasites, and the part they play in the Economy of Nature.
Observations on Hæmatozoa.
Remarks on the Entozoa and Ectozoa of Fish.
Entozoa in Beef.
Krabbe on the Intestinal Worms of Domesticated Animals.
Revised List of Entozoa, with notes and references. Nos. 1 and 2.
Parasites and Parasitic Diseases.
The Grouse Disease.
Description of a new Generic Type of Entozoon from the Aard Wolf.
Notes on Entozoa, Parts 1 and 2.
Opening of the Winter Session of the Royal Veterinary College, Oct. 1, 1873. Introductory Address. From the Author.

College Reports, Catalogues, etc. From the Publishers.

Colonial Museum and Geological Survey of New Zealand. James Hector, M.D., Director. Eighth Annual Report and Meteorological Report, 1873. Wellington, 1873–74. From the Director.

Cooke, Josiah P., Jr. The Vermiculites. From the Author.

Commission of Fish and Fisheries U. S. Part II. Report of the Commissioners for 1872 and 1873. Washington, 1874. From the Commissioner.

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